



Weatherization Assistance Program

Weatherization Policies and Procedures for Energy Audits

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The guidance in this manual is effective for all energy audits completed after August 1, 2020 with DOE WAP or DHS LIHEAP funds. These policies will continued to be evaluated for improvement in future program years.

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TERMS AND DEFINITIONS

Additional Cost:	The cost to pay for extra work that is <u>absolutely</u> needed in order to complete the measure, and that will ONLY be done if the measure is done. For example, a dam around an attic hatch must be installed before new attic insulation can be added but would not be built if no new attic insulation is added.
AFUE:	Annual Fuel Utilization Efficiency is an efficiency measure for combustion furnaces, boilers and water heaters. Given that this is a lab-tested result, it is the only efficiency measure available for a new unit prior to its installation.
Ancillary Repair	Items necessary for the proper installation of weatherization materials...“to achieve a finished product in a typical installation where no unusual or extensive repairs are needed. Ancillary items typically refer to small items such as hardware, fasteners, adhesive, sealant, etc.... ¹ ” Ancillary Repairs are noted in NEAT/MHEA, as Additional Costs.
Attic hatch	Also known as a scuttle hole; this is the access point to an unfinished attic.
Collar beam	The flat ceiling area at the top of a finished attic space.
Combustion Appliance Zone (CAZ)	Room and enclosed air volume that contains a combustion appliance. This may include, but is not limited to, a mechanical room, mechanical closet, or main body of the home.
Conditioned Stories	The number of conditioned stories in a home. Include finished basements that are (1) mostly above grade or (2) mostly below grade but with a direct exit to the outdoors.
EER	Energy Efficiency Ratio is a measure of how efficiently a cooling system will operate when the outdoor temperature is at 95°F. It is the typical efficiency unit for window air conditioners and must be converted to SEER in NEAT.
Energy Audit	The energy audit is an evaluation of the home and will address energy usage and limited aspects of building durability and occupant health and safety. It will provide a comprehensive report with a list of prioritized recommendations to improve the home energy efficiency and will include a cost-benefit analysis according to federal and state regulations. Energy audits shall be based on building science principles and include the use of appropriate equipment in diagnosing opportunities for improving energy efficiency and minimizing health and safety hazards. An energy audit consists of both the physical assessment and the data entry into an ODOC approved energy audit modeling software.
Energy Auditor	An Energy Auditor (EA) is a building scientist who evaluates the energy efficiency and health and safety of a building and identifies areas for savings by gathering empirical data, conducting tests and using energy modeling software, in order to reduce the energy consumption, improve the safety, and increase the lifespan of a building; while improving the quality of life and comfort for building occupants. ²

¹ WPN 19-5

² NREL Single-Family Energy Auditor JTA (2018)

Energy Conservation

Measure	An ECM is “an installation procedure performed for its anticipated energy savings. ECM costs must include all material, labor, and ancillary items and must meet a Savings to Investment Ratio (SIR) of 1.0 or greater to be installed with WAP funds.” ³
Energy Factor	Measure of the overall energy efficiency of certain appliances. Most often used for water heaters, dishwashers and clothes washers & dryers.
Foundation Wall:	The masonry or concrete walls that serve as the main support for a structure. They are at least partly below grade, typically going down as far as the frost line, and can also form the walls of a basement area.
Glazing:	Refers to the glass of a window, i.e., double pane, single pane, etc.
Health & Safety	“The actions taken to eliminate a health and safety hazard, the elimination of which is necessary to effectively perform weatherization work, OR the actions are necessary as a result of weatherization work.” ⁴ See CAA Manual Requirement 307 for complete Oklahoma H&S Policy. Use the flow chart in Appendix A to help you determine if a measure is a legitimate health and safety measure.
HSPF:	Heating Seasonal Performance Factor is the term used to measure the heating efficiency of a heat pump. Usually between 6 and 9.
IID:	An intermittent Ignition Device. These have replaced pilot lights as a way to ignite a combustion fuel source when the appliance is in use. Also called a Glow Plug.
Incidental Repair	A repair necessary for the effective performance or preservation of newly installed weatherization materials, but not part of standard installation ⁵ . These MUST be related to a weatherization measure the agency is installing. For example, a roof leak can be an IRM if new attic insulation is being installed. However, it cannot be an IRM if no new insulation is being installed as the repair does not protect a measure paid for by DOE. IRMs will not affect the SIR of any individual ECM. However, they will reduce the Whole House (Cumulative) SIR for this job. Incidental Repairs cannot exceed \$750 per unit, without ODOC prior approval. ⁶ Use the flow chart in Appendix A to help you determine if a measure is a legitimate IRM.
Input Capacity	The amount of energy (fuel) that an appliance will consume for every hour of use. This can normally be found on data plates or stickers.
Knee wall	A wall that is often about knee height (hence the name) that, most typically, is found separating conditioned and unconditioned attic spaces.
Major Measures	These are high priority measures, which if skipped, would result in only a “partial” weatherization of a unit. Major measures are as follows: air sealing, duct sealing of ducts outside the thermal boundary, attic insulation, wall insulation and floor or belly insulation. See Appendix E for more information

³ WPN 19-5

⁴ WPN 17-7

⁵ WPN 19-5

⁶ CAA Manual, Requirement 309

Measure Skipping	Measure skipping is not installing, in order of decreasing Savings to Investment Ratio (SIR), the cost-justified Energy Conservation Measures (ECMs) and related Incidental Repairs Measures (IRM) included in the work scope produced by the Department of Energy (DOE) approved energy audit tool or priority list ⁷ .
Outer Ceiling Joist	The unconditioned floor area of attic behind the knee wall of a finished attic.
Output Capacity:	The maximum amount of heat energy that an appliance is capable of supplying to the conditioned space, or towards meeting the energy demand. It is sometimes referred to the amount of energy (fuel) that an appliance will effectively output. Depending on the efficiency of the appliance, and the fuel type, the Output Capacity will be equal to or less than the Input Capacity. This difference is usually equal to the amount of energy that is lost up a chimney or flue and is not used by the home to meet energy demand.
Primary Heat	The primary heat source is that installed unit which is most relied on by the client to provide heating throughout the season ⁸ . Portable heat units can never remain as the primary heat source in a home after weatherization is complete.
Quality Control Inspector	A QCI is a residential energy-efficiency expert who ensures the completion, appropriateness, and quality of energy upgrade work by conducting a methodical inspection of the building and performing safety and diagnostic tests. ⁹
Recovery Efficiency:	For water heaters, it is the ratio of energy delivered (to the water) to the energy content of the fuel consumed by the water heater.
Roof Rafter:	The studs that form the support for the roof assembly.
Secondary Heat	Secondary heat is any source of heat intended and used to provide less than 50% of the heat in a home. This can be a supplemental heat source used regularly or an emergency heat source used at need. The auditor must judge, through discussion with the client, approximately what percentage of heat is provided through the year by secondary heat sources.
SEER:	Seasonal Energy Efficiency Ratio is the most commonly used measure of the efficiency of a central air conditioner, including the cooling function of a heat pump.
Sill Plate:	The sill is the strong horizontal member at the base of any structure, which sits atop the foundation. For the purpose of the NEAT, we are considering the whole Sill-box that comprises the sill and rim/band joist. This is typically 2x6 to 2x10.
Space Heater:	A non-ducted heating unit that, by definition, heats up the space around the heater. Can be vented or unvented.
Steady State Efficiency:	Measures how efficiently a furnace converts fuel to heat, once the furnace has warmed up and is running steadily (i.e., stack temperature is steady). This is measured in the field on an existing furnace, using a combustion analyzer.
Storm Door:	A secondary door, usually with a large percentage of glass, which buffers the primary door from the elements.

⁷ WPN 19-4, Attachment 8

⁸ WPN 17-7

⁹ NREL Single-Family Quality Control Inspector JTA (2018)

Stud:	The vertical upright pieces of lumber in the walls of a "stick-built" home.
Tonnage (Capacity):	Air conditioners are often referred to in terms of tonnage. One ton is equal to 12000 BTU/hr.
Top Plate:	Similar to the Sill Plate, but this sits at the top of the structure, on top of all walls both interior and exterior. It is an important location for air sealing.
Vapor Barrier:	<p>Another name for any of the three classes of vapor retarder. This is a membrane designed to limit the movement of water vapor. Typically, these are used in wall construction, but also can be laid to cover a crawlspace floor.</p> <ul style="list-style-type: none"> • Class I – Very low permeability vapor retarders – rated at 0.1 perms or less. • Class II – Low permeability vapor retarders – rated greater than 0.1 perms and less than or equal to 1.0 perms. • Class III – Medium permeability vapor retarders – rated greater than 1.0 perms and less than or equal to 10 perms.
White Roof:	To be deemed a white roof, the roof coating must effectively work at improving the SRI (Solar Reflectance Index) of the roof.

1. ENERGY AUDIT GENERAL REQUIREMENTS

1.1. ENERGY AUDIT

- 1.1.1. All Subgrantee Recipients are responsible for conducting an energy audit, following the National Energy Resource Laboratory's (NREL) Energy Auditor (EA) Job Task Analysis (JTA) on all weatherization eligible dwelling units for both the Department of Energy Weatherization Low-Income Assistance Program and the Department of Human Services Low Income Housing Energy Assistance Program Weatherization contracts.

1.2. ENERGY AUDIT SOFTWARE

- 1.1.2. Subgrantee Recipients shall work with ODOC to comply with the requirements of 10 CFR 440.21 Weatherization Materials Standards and Energy Audit Procedures. The most recently approved release of the NEAT/MHEA audit software shall be used to assign priorities among individual weatherization materials in descending order of their cost effectiveness (2012 Version 8.9.0.5).

1.3. ENERGY AUDITOR

- 1.1.3. For PY2020, an assessment can only be completed by anyone who has met Energy Auditor training requirements of CAA Manual Requirement 311. It is the responsibility of the qualified energy auditor to accurately assess the existing conditions in a client's home, based on visual and diagnostic testing. Accurate data entry is necessary for a reliable determination of energy conservation measures (ECMs) for a home. It is the auditor's responsibility to input the most accurate data possible based on the data collected during the audit of the home.

2. PHYSICAL ASSESSMENT/DATA COLLECTION

2.1. REQUIRED ENERGY AUDIT DOCUMENTATION

- 2.1.1. Data collected during a residential audit shall be collected by the auditor
 - 2.1.1.1. Use **Form 28A Energy Audit Data Collection Form** for site-built homes
 - 2.1.1.2. Use **Form 28B Energy Audit Data Collection Form** for mobile home
- 2.1.2. For all homes that receive an energy audit, both the Energy Auditor that completed the Energy Audit and Quality Control Inspector that conducted the final inspection must complete Form 45 – Energy Audit Checklist
- 2.1.3. Under all circumstances, client education **MUST** be provided by the Subgrantee Recipient when an issue is found in a home, even if a home is deferred or if the issue is abated. Client education must be documented with the client signature on Form 25.
- 2.1.4. An Energy Auditor must collect sufficient photo documentation of the home, including, but not limited to:
 - 2.1.4.1. Exterior views of every wall of the home
 - 2.1.4.2. Legible photos of manufacturer's tags for heating, cooling and DHW appliances.
 - 2.1.4.3. Photos of the diagnostic test results, including Combustion Analysis, Fridge Metering, Blower door and duct blaster.
 - 2.1.4.4. Only those pressure pans with are an unusually high reading need to be photo documented.
 - 2.1.4.5. Photo of wall insulation being investigated.
 - 2.1.4.6. Photos of attic area including attic insulation being measured.

- 2.1.4.7. Photos of crawlspace area including height, crawlspace entrance, and crawlspace joist size.
- 2.1.4.8. Photo of the existing condition(s) for any other item that is being installed or repaired.
- 2.1.4.9. Any health and safety issue to be addressed by weatherization.

2.2. DEFINING THE CONDITIONED BOUNDARY

- 2.2.1. The conditioned boundary defines the space of a home that is purposely heated and/or cooled. It can also be called the thermal boundary or the building envelope.
- 2.2.2. While the presence of ductwork to a room clearly marks it as part of the conditioned space, supply registers in a room are not required. Any area that is open to the rest of the house through a permanently or typically open passageway should be considered as part of the conditioned space.
- 2.2.3. Discussions with the client can help clarify where the boundary of the conditioned space should be set.
- 2.2.4. The conditioned boundary is always at least partly defined by the exterior walls. However, it can also be defined by interior walls. These may include:
 - 2.2.4.1. Interior walls surrounding an unconditioned CAZ (if the CAZ receives direct combustion air from outside)
 - 2.2.4.2. Stairways leading to unconditioned attics.
 - 2.2.4.3. Stairways leading to unconditioned basements.
- 2.2.5. An area cannot be considered Unintentionally Conditioned when determining the conditioned boundary. It is either conditioned or unconditioned.
 - 2.2.5.1. Unintentionally Conditioned is a designation used in NEAT/MHEA to adjust certain values (such as water heater heat loss). To choose this, you must reasonably believe that the entire space is heated at least 1 degree Fahrenheit due to the waste heat from the furnace, boiler and/or water heater. This is very rare except for homes with boiler pipes throughout an unconditioned space.

2.3. AIR SEALING TARGETS

- 2.3.1. The determination of a realistic and achievable target, while maximizing the air sealing measure, is the first step in achieving a CFM target.
- 2.3.2. The goal must always be to ventilate right (ASHRAE) and tighten a house as much as possible using the infiltration funds that have been justified for the house. Reaching a minimum target number alone is not sufficient reason to stop infiltration reduction work, if there are additional opportunities to air seal. We need to maximize effective air sealing efforts in every house weatherized.
- 2.3.3. To determine the blower door after-weatherization target the auditor must use the ODOC Target Form. This form determines a target based on ACH (Air Changes / Hour), MRV (Minimum Reduction Value), size of the home, and initial blower door to make calculations. This form is also taking into account the building tightness limit and required ventilation in the calculations.
 - 2.3.3.1. If the automated target from the form is too tight given the state of that current unit, then the target to use needs to be adjusted manually based on previous experience and your best professional judgment.
 - 2.3.3.2. An explanation for this change must be recorded in the Comments on the Infiltration page in NEAT MHEA.
 - 2.3.3.3. If the automated target is always too tight, then additional techniques and training might be necessary for your staff/contractor to help you be more effective at air sealing with your typical housing stock.
- 2.3.4. Blower door target must be met for the measure to pass at final inspection and/or QCI. Result can be lower than target but, if higher, must be within 10% of target.
- 2.3.5. If target is not achieved at Final or QCI due to changes to the pressure boundary of the home that occurred after weatherization was completed, these changes must be clearly documented to determine if the measure should pass.

2.4. DUCT TESTING REQUIREMENTS

- 2.4.1. Evaluate and examine the duct system.
 - 2.4.1.1. Visually inspect ducts, return and supply plenums, and distribution boxes outside of the thermal boundary to verify and check insulation values. R-value shall meet or exceed the insulation requirements of the SWS, which is an R-8.
 - 2.4.1.2. Check for restrictions to air flow.
 - 2.4.1.3. Check for large holes or gaps that may bring insulation into conditioned space from the attic when testing.
- 2.4.2. Ducts shall be tested for leakage using a Duct Blaster and pressure pan test for all site-built homes that have ducts and a functional forced air system.
- 2.4.3. The pressure pan test must include testing of the return register (if present).
- 2.4.4. All manufactured homes with ducts and a functional forced air system must be tested with a pressure pan test.
 - 2.4.4.1. A Duct Blaster test is not required for manufactured homes. Although, if it is possible and practical to run a Duct Blaster test, then it should be a best practice to also do this on manufactured homes.

2.5. DUCT SEALING TARGETS

- 2.5.1. Duct Sealing After weatherization target will be calculated as follows¹⁰:
 - 2.5.1.1. Total Leakage: 12% of total conditioned floor area of home
 - 2.5.1.2. Leakage to outside: 8% of total conditioned floor area of home
- 2.5.2. If auditor feels confident that the target as calculated cannot be met, he/she can adjust the target up or down to something more achievable.
- 2.5.3. An explanation for this change must be recorded in the Comments on the Infiltration page in NEAT MHEA.
- 2.5.4. Duct sealing target must be met for the measure to pass at final inspection and/or QCI. Result can be lower than target but, if higher, must be within 10% of target.
- 2.5.5. If target is not achieved at Final or QCI due to changes to the pressure boundary of the home that occurred after weatherization was completed, these changes must be clearly documented to determine if the measure should pass.

2.6. STATIC PRESSURE TESTING OF DUCTS

- 2.6.1. Static pressure of Supply and Return ducts will be tested in any home with a ducted system where (procedure explained in 3.9.2.1):
 - 2.6.1.1. There is a functional blower motor for heating and/or cooling AND
 - 2.6.1.2. Duct Leakage testing is being performed
- 2.6.2. If there is no functional blower motor or for some other reason testing cannot be performed, auditor is to use 25 Pa as the Pre result for both Supply and Return; and 30 Pa as the Target for both Supply and Return.
- 2.6.3. An explanation for why this test could not be performed must be provided in the Comments of the Infiltration page.

2.7. INSULATION DIAGNOSTIC / REQUIREMENTS

- 2.7.1. All building cavities that define the thermal boundary between the conditioned space and unconditioned must be inspected and documented for existing insulation thickness, type, quality and location.
- 2.7.2. It may be necessary to inspect multiple areas of the thermal boundary using a combination of methods (e.g., visual inspection, non-conductive probe, borescope, and/or non-destructive imaging) to determine insulation R-value.

¹⁰ The ODOC Target Spreadsheet may be used to complete this calculation

- 2.7.3. Photo documentation showing the investigation and measurement of insulation is required.
- 2.7.4. Existence of gaps or voids which would reduce the effective R-value must be documented and photographed where possible.
- 2.7.5. Degrading of existing insulation R-value due to gaps, voids or age is allowable as long as it is well documented with notes and photographs.
- 2.7.6. The use of a weighted average calculation is required.
 - 2.7.6.1. A calculator for this can be found at: <https://www.redcalc.com/parallel-path-r-value/>
 - 2.7.6.2. Input R1 for any area that has no insulation. Do not use any number lower than 1.0 in the calculation.
 - 2.7.6.3. This calculation must be saved as PDF or printed on paper, and a copy retained in the client folder.
- 2.7.7. Wall insulation needs to be assessed for the existence, type and thickness of insulation.
 - 2.7.7.1. At least one exterior wall of the original home must be inspected.
 - 2.7.7.2. At least one exterior wall of each addition must be inspected.
 - 2.7.7.3. Inspection for wall insulation shall be performed by drilling a minimum 1" hole in a wall. Examine wall cavity through this hole and photograph presence or absence of insulation.
 - 2.7.7.4. Holes shall be sealed with an appropriately-sized cap. Use caulk to air seal the cap to the wall.

2.8. CRAWLSPACE

- 2.8.1. Note the foundation type(s) (e.g., slab on grade, crawl space, basement), construction type (e.g., stone, brick, poured concrete), location of the thermal boundary, and exposure above grade. When feasible, note location and condition of the pressure boundary and the moisture barrier.
- 2.8.2. If a foundation is a basement or crawlspace, note any intentional venting, and note whether the space is fully conditioned, semi-conditioned (unintentionally conditioned) or intentionally unconditioned.
- 2.8.3. Note any insulation on foundation walls, ceiling (if a basement or crawlspace), and/or floor, as well as any degradation or installation issues with existing insulation.
- 2.8.4. Note any thermal bypasses observable from the basement or crawl space(s), such as chases or open wall cavities that extend up into the structure, as well as air leaks from the foundation space to the ground or outside.
- 2.8.5. When home energy upgrades for foundation insulation are proposed, indicate the surface area(s) and construction type, recommended effective R-value, and the thickness, type and performance characteristics (e.g., perm rating) of insulation. Insulation recommendations shall be based on the building's moisture barrier, thermal barrier, air barrier, and drainage plane (as applicable)
- 2.8.6. All foundation data must be input accurately regardless of whether any measure will be performed in the crawlspace.
- 2.8.7. Foundation wall height must be the average height of the foundation area. Do not input the lowest height.
- 2.8.8. A crawlspace area will not be insulated where the average height in that area is less than 2 feet as measured from the ground to the bottom of the floor joists. This is automatically determined by NEAT – do not choose NONE for insulation type.
- 2.8.9. Crawlspaces in which part of the area has an average height over 2 feet and part has an average height below 2 feet must be input as separate foundations in NEAT. The intent is to have insulation provided for those areas that have a height at or above 2 feet.
- 2.8.10. Install vapor barrier for any crawlspace to which floor insulation is being added. This measure will be an Incidental Repair.
 - 2.8.10.1. This is optional for mobile homes since the belly will act as a vapor barrier.

2.9. HVAC

- 2.9.1. If it is known that an HVAC system will be replaced with non-DOE funds (e.g.: LIHEAP), then the new unit must be modeled as if it is already existing in the home.
- 2.9.2. The appliance shall be placed in operation only after it has been determined that it is safe to operate the appliance.
- 2.9.3. Evaluate the furnace. Complete a visual inspection of the forced-air furnace and document information.
- 2.9.4. Check the condition of the following on the furnace -
 - 2.9.4.1. Document information from the manufacturer's tag.
 - 2.9.4.2. Furnace cabinet and removable panels
 - 2.9.4.3. Return and supply duct connections
 - 2.9.4.4. Filter and filter slot cover
 - 2.9.4.5. Temperature rise and compare to manufacture specifications.
 - 2.9.4.6. If the Furnace is a condensing model, check the condensate drains, connections, and condensate pump if one exists.
- 2.9.5. Evaluate air-conditioning and heat-pump. Complete a visual inspection of the air conditioning and heat-pump and document information.
 - 2.9.5.1. Examine the outdoor coil cabinet
 - 2.9.5.2. Check clearances.
 - 2.9.5.3. Examine the condition of coils.
 - 2.9.5.4. Examine the condition of insulation on refrigerant piping.
 - 2.9.5.5. Document information from the manufacturer's tag.
- 2.9.6. Examine the indoor coil/air handler
 - 2.9.6.1. Check filter and filter slot cover.
 - 2.9.6.2. Check condensate pan, connections, drain lines, and the condition of condensate pump if it exists.
 - 2.9.6.3. Check the integrity of the accessible refrigerant piping insulation in the interior of the building.
 - 2.9.6.4. Examine the inside of the air handler cabinet for a dirty blower and restricted coils.
 - 2.9.6.5. Document information from the manufacturer's tag.
- 2.9.7. If the HVAC system is a different type (e.g. minis-split, combo package, window units...), it still needs to be examined and tested if needed for audit or required by policy.
- 2.9.8. Combustion Analysis must be performed on any forced air combustion heating system following ANSI/BPI 1200 Standards. If analysis could not be performed, indicate your reason on FORM 28 and in the NEAT/MHEA Energy Audit comments.
 - 2.9.8.1. This includes but is not limited to diagnostic testing for CAZ depressurization, spillage, carbon monoxide levels, and combustion efficiency.
- 2.9.9. It is allowable to drill into B-vent for the purpose of combustion analysis so long as:
 - 2.9.9.1. No drilling allowed into PVC flue pipe on 90% furnaces.
 - 2.9.9.2. The hole drilled is no bigger than required for testing.
 - 2.9.9.3. The holes are sealed with high temperature caulk to seal both the inner and outer sleeves. Use metal tape for extra assurance to seal around the outer hole.
- 2.9.10. Manual J must be performed by the HVAC contractor for any new HVAC install. Manual J must be calculated based on conditions in the home AFTER weatherization.
- 2.9.11. Window AC EER must be converted to SEER (NEAT only): $SEER = (1.2 \times EER) - 0.7$
- 2.9.12. If a CAZ is found to have direct combustion air from outside, or will have outside combustion air installed through a weatherization measure:
 - 2.9.12.1. The door and walls of that closet must be considered as exterior components and modeled appropriately so that they can be air sealed and/or insulated.
 - 2.9.12.2. Alternatively, the auditor may seal the existing combustion air supply in order to bring the CAZ into the conditioned space of the home. The following rules apply:

- 2.9.12.3. It must be determined that the volume of the home will provide enough combustion air by using the following calculation: Required volume = 50 cubic feet per 1000 BTU of combustion appliance.
- 2.9.12.4. If a door to this CAZ exists, there must be a louvered door or other type of opening providing sufficient access for combustion air¹¹. The minimum is 100 square inches net free air vent both at the high end and low end of the door. 100 square inches net free is roughly equivalent to a 10"x15" grill.
- 2.9.13. If the primary heating system is non-operational, there are three options:
 - 2.9.13.1. If a replacement system will be installed using funds from another funding source, model the new system as the existing unit and note this in the Comments. The auditor will need to determine efficiency and size of new unit.
 - 2.9.13.2. If a replacement system will be installed using ODOC H&S funds, model the existing broken furnace and choose Replacement Mandatory (do NOT Include in SIR). Explain the reason for this replacement in Comments.
 - 2.9.13.3. To attempt an ECM replacement: Model the heat that exists and is functional. It can be as little as a few space heaters, or even just an oven. There is no minimum to what truly exists. Choose Evaluate All and enter appropriate replacement data.
- 2.9.14. If the unit is working but will be replaced as H&S, choose 2.9.13.2.

2.10. DOORS AND WINDOWS

- 2.10.1. Inspect and evaluate windows -
 - 2.10.1.1. Frame material (wood, metal, vinyl, etc.)
 - 2.10.1.2. Glass type (number of panes, coatings, or gas fill)
 - 2.10.1.3. Condition and operation
 - 2.10.1.4. Presence and type of storm windows
- 2.10.2. Inspect and evaluate doors -
 - 2.10.2.1. Determine if the door is insulated.
 - 2.10.2.2. Determine whether the door is wood, metal, or fiberglass.
 - 2.10.2.3. Inspect and evaluate the door frame, trim, and door components
 - 2.10.2.4. Note and document if the door does not open, close, or lock properly.
- 2.10.3. Doors and windows can no longer be replaced with air sealing funds, under any circumstances.
- 2.10.4. Doors are to be input as Loose only if it is not possible to air seal that door.
- 2.10.5. Photo documentation is mandatory showing existing conditions that lead to replacement for all door and window replacements.

2.11. REFRIGERATORS

- 2.11.1. Document refrigerator model number, the date of manufacture, and condition.
- 2.11.2. Fridges must be metered if they are to be replaced with Weatherization funds
 - 2.11.2.1. A meter must run for no less than 120 minutes.
 - 2.11.2.2. A legible photo of the metered result is required.
- 2.11.3. If the fridge is not metered, do not choose a replacement option in NEAT MHEA.
- 2.11.4. Replacement refrigerators shall be sized as follows:
 - 2.11.4.1. 1-4 occupants: install 18 cu. ft. fridge;
 - 2.11.4.2. 5-9 occupants: install 21 cu. ft. fridge.

2.12. WATER HEATERS

- 2.12.1. Note the location, type, and general condition of the domestic water heater
- 2.12.2. Inspect for signs of soot, debris, and spillage.

¹¹ NFPA 54

- 2.12.3. Check and document the presence and condition of tank insulation wrap.
- 2.12.4. Check and document the presence and condition of the overflow pan if DWH is located where moisture could cause a problem.
- 2.12.5. Document temperature control setting and water temperature.
- 2.12.6. Check and document the presence and condition of the pipe insulation.
- 2.12.7. Check and document the presence of the TPR valve and piping. Check and document rating of TPR valve and compare to manufacturer's specifications for DWH.
- 2.12.8. Inspect for leaks.
- 2.12.9. Water heater data must be entered correctly. If the client's water heater cannot be found in the internal database, do NOT choose an alternative. Enter only such data as you are able to collect from the manufacturer's tag and/or an internet search.
- 2.12.10. If an ECM replacement of the existing water heater is desired and the existing water heater does not exist in NEAT's internal database:
 - 2.12.10.1. You can research the Energy Factor (EF) of the existing unit. If found, keep a copy of the model information. At this point, you can choose a similar model from the database with the same EF as the existing unit.
- 2.12.11. If a combustion water heater has, or will receive, dedicated combustion air directly from outside, follow the rules in 2.9.12.

2.13. LIGHTBULBS

- 2.13.1. LED lightbulb replacement can be input directly on the Lighting page.
- 2.13.2. CFL bulbs will no longer be allowable with any ODOC weatherization grant funds.
- 2.13.3. Use the following table to determine the correct LED bulb wattage.

Incandescent	NEAT CFL equivalent	LED equivalent
100W	26W	18W
75W	18W	9 or 13W
60W	13W	7W
40W	7W	5W

2.14. GENERAL HEAT WASTE REDUCTION

- 2.14.1. Subgrantee Recipients may use general heat waste (GHW) reduction weatherization materials that have been determined to be generally cost-effective without the need for a site-specific energy audit¹². The maximum allowable expenditure, in total for all GHW items, is set at \$250 by DOE.
- 2.14.2. The approved, presumptively cost-effective materials include: water heater wrap (i.e., insulating blanket); water heater pipe insulation (on six feet of hot water pipe exiting water heater); faucet aerators; low-flow showerheads; limited weather-stripping and caulking to increase comfort (does not include major air sealing work, which should be guided by blower door testing;) and furnace or air conditioner filters.
- 2.14.3. Any of these measures can be entered in NEAT MHEA as an Incidental Repair, if they cannot be achieved as an ECM. The measure does not have to be tied to any weatherization measure being installed. Add to comments that this is a GHWR measure.

2.15. HEALTH AND SAFETY CONSIDERATIONS

- 2.15.1. Health and Safety measures must satisfy the rules set forth in DOE WPN 17-7, 19-5, and the CAA Implementation Manual Requirement 307.
- 2.15.2. A list of allowable H&S measures can be found in Requirement 307, Section III, page 78. Inclusion in this list does not necessarily mean a measure is an allowable health & safety expense.

¹² CAA Manual Requirement 309, Section II-D

- 2.15.3. "Assume that if a cost is NOT listed as allowable... it is not an allowable DOE [or DHS LIHEAP] WAP expense." (CAA, page 79, Item 1).
- 2.15.4. If unsure, auditor must request a decision by ODOC.

2.16. EXHAUST FANS

- 2.16.1. Bathroom local exhaust fans need to be tested as per the requirement of ASHRAE 62.2.
 - 2.16.1.1. ASHRAE 62.2 Section 5 requires bathroom local exhaust fans to be vented outside and to have a minimum demand-controlled airflow of 50 CFM or continuous airflow of 20 CFM.
 - 2.16.1.2. See Table 5.1 from ASHRAE 62.2 for further guidance.
- 2.16.2. ASHRAE 62.2 also requires local exhaust kitchen fans to be tested, vented outside, and have a minimum demand-controlled airflow of 100 CFM.
 - 2.16.2.1. Any home with a gas range must be provided with a range hood vented to outside. This can be an ASHRAE continuous run fan or an intermittent fan. This will be a health & safety cost.
 - 2.16.2.2. See Table 5.1 from ASHRAE 62.2 for further guidance.
- 2.16.3. The installation of required local ventilation may meet ASHRAE 62.2 requirement for additional dwelling unit ventilation, and this needs to be considered during the audit.
- 2.16.4. Run Red Calc to determine if additional dwelling unit ventilation is needed. See Appendix F for guidance.
- 2.16.5. Any functioning exhaust fan that will remain in the home after weatherization must be vented to the outside. This shall be funded with Health and Safety funds.

2.17. INDOOR AIR QUALITY AND VENTILATION

- 2.17.1. The energy audit shall include inspection of air infiltration sources, air barriers and ventilation.
- 2.17.2. Consider the house ventilation as a system, including both whole-building ventilation and local exhaust ventilation.
- 2.17.3. The energy audit shall include the following:
 - 2.17.3.1. Identification of sources of indoor air pollutants.
 - 2.17.3.2. For houses with an attached or "tuck under" garage, identification of joints, seams, penetrations, openings between door assemblies and their respective jambs and framing, and other sources of air leakage through walls and ceilings separating the garage from the residence and its attic area.
 - 2.17.3.3. Evaluation of terminations of all exhaust fans and clothes dryer vents.
 - 2.17.3.4. Evaluation of existing ventilation systems in the dwelling.
 - 2.17.3.5. Determination of the ventilation needs.

3. ENERGY AUDIT SOFTWARE MODELING

3.1. INTRODUCTION

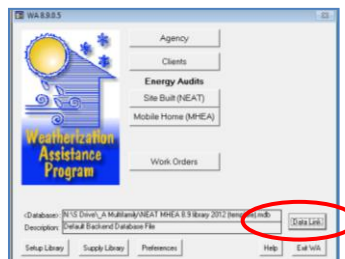
- 3.1.1. Oklahoma has been DOE approved for Site Built and Mobile Home using Weatherization Assistant 8.9.
- 3.1.2. Oklahoma is approved for Multi Family weatherization audits using the NEAT audit on buildings with 4 or less units. This will be covered in a future WPN and trainings provided by ODOC.

3.2. GENERAL RULES FOR USE OF WEATHERIZATION ASSISTANT 8.9 (NEAT/MHEA)

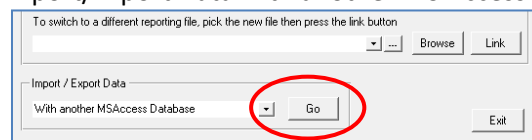
- 3.2.1. Cost of a measure must include the total estimated cost of both the labor and material for that measure.
- 3.2.2. Agencies with in-house crews must calculate estimated labor costs based on a consideration of the cost, time and number of staff involved with any particular measure.
- 3.2.3. Choose EVALUATE ALL for all measures.
- 3.2.4. Mandatory Replacements as an ECM ("Include in SIR" checked) is allowed only with written State approval.
- 3.2.5. Mandatory H&S measures are allowed ("Include in SIR" NOT checked) so long as the measure satisfies the requirements of a Health and Safety measure.
- 3.2.6. Choosing NONE is also a Mandatory choice. Do **NOT** choose NONE.
- 3.2.7. If for any reason a non-major measure is not possible to install, the reasons for not installing an ECM measure must be clearly explained in the NEAT/MHEA comments and noted on Form 44.
- 3.2.8. If for any reason a major measure is not possible to install, contact ODOC for guidance. A major measure cannot be skipped or otherwise deactivated in the software program unless you have ODOC written approval to do so.

3.3. DATA LINK - CREATE A NEW WDW FILE FOR EXPORT:

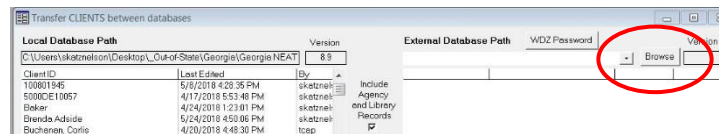
- 1. Hit the **Data Link** button



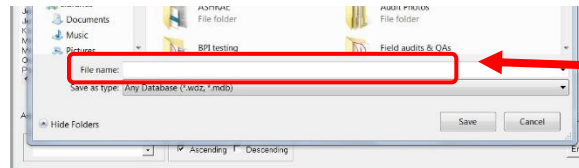
- 2. Press **GO** at bottom of page (Import/Export Data with another MS Access Database)



3. Press **BROWSE** (near top right of page)

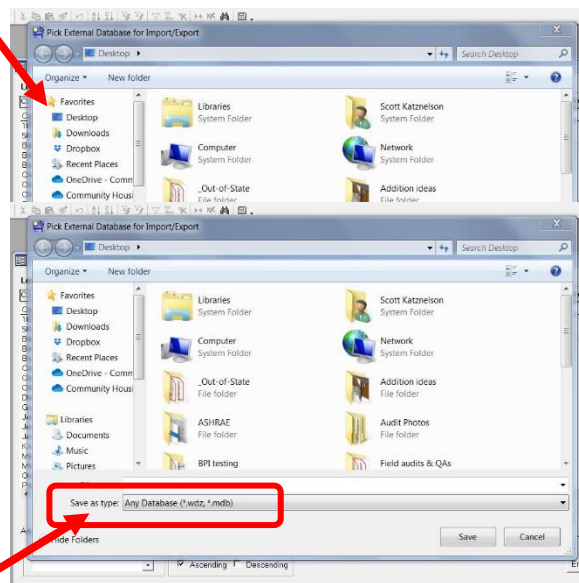


4. A new window will pop up. Type in a file name near the bottom of that window



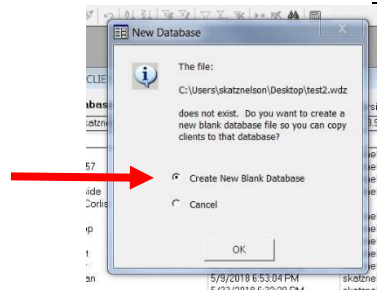
File Name
Here

5. Choose Desktop in the top left column as the location to save this new WDW file so that it is easy to find. (you may have to scroll up or down to find Desktop)

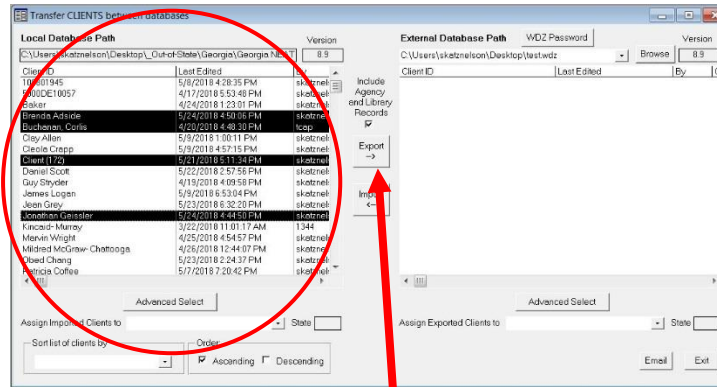


6. Under **SAVE AS TYPE**, choose 'ZIPPED WEATHERIZATION DATABASES (WDZ)'. Press **SAVE** (bottom right of window)

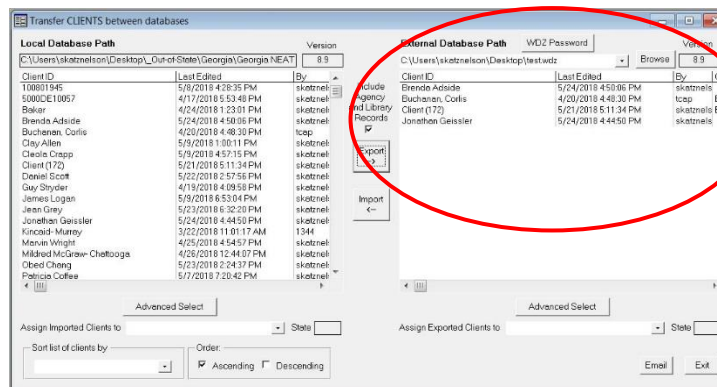
7. A box will pop up asking you if you want to create this file. Click on: Create New Database File. Press **OK**



- Choose client or clients you wish to export from the list on the left (multiple clients can be chosen by holding down the control button while you choose all clients you wish copied).



- With chosen client(s) highlighted in black, press **EXPORT** button in middle of page.
- Once you have exported, the screen will look like this, with the one or more clients you chose in the box on the right:



- Find file you have created and send by email or copy it on to a memory stick. The WDX file will have an icon that looks like a white piece of paper with one folded corner.

3.4. TO LOAD A NEW DATABASE/LIBRARY

TO LOAD A NEW DATABASE:

- Once in the Data Link section, press **BROWSE** button near top of page.
- Find the new database file you want to link to. Select and press 'Open'.
- Press **LINK** button (to right of **BROWSE** button)
- Click OK twice, when asked.

3.5. SETUP LIBRARY

1. Most Setup Library Tabs have both NEAT and MHEA options. Changes have to be made in both manually. Look in the lower left corner.

These 3 tabs are the most critical to getting NEAT right.

We'll look at those next...

Library Name: ODOC Setup Library

Agency: ODOC State: OK

<Supply Library>: ODOC Supply Library

Description:

Comment:

by Library Name: 1 of 1

REPORT: Select Report: Library Measure Costs

Preview Print Snapshot File

How many Setup Libraries do you have?
The fewer the better. 1 is best.

But sometimes it's worth having more
than 1, like if you use different
contractors with very different prices

3.6. KEY PARAMETERS

1. The three tabs to keep updated are Insulation, Equipment and Windows.

a. Insulation

Setup Library Information Key Parameters Fuel Costs (1) Fuel Price Indices Library Measures User Defin			
Economics Set Points Insulation Equipment			
	Name	Value	Units
▶	Avg annual outside film coeff	2.25	BTU/hr-sqft-F
	Uninsulated R-value for 'Other' wall type	4.42	F-sqft-hr/Btu
	R-value for 'Other' exterior siding type"	0.6	F-sqft-hr/Btu
	R-value per Inch for the 'Other' existing ceiling insulation type	3.09	F-sqft-hr/Btu-in
	Added duct insulation R value	8	F-sqft-hr/Btu
	Water heater wrap added R value	10	F-sqft-hr/Btu
	Base value of free heat from internals	2600	BTU/hr

These two need to be updated based on the minimum R-Value you are installing.

b. Equipment

Setup Library Information Key Parameters Fuel Costs			
Economics Set Points Insulation Equipment Windows			
	Name	Value	Units
▶	Window A/C replacement SEER	11	Btu/wh
	Central A/C replacement SEER	14	Btu/wh
	Heat pump replacement SEER (Cooling)	14	Btu/wh
	SEER used to impute cooling savings	14	na
	Low flow shower head flow rate	2.5	gal/min
	Refrigerator defrost cycle energy	0.08	kWh

All these need to be updated based what you are typically installing.

c. Windows

Setup Library Information Key Parameters Fuel Costs (1) Fuel			
Economics Set Points Insulation Equipment Windows			
	Name	Value	Units
▶	Replacement Window U-Value	0.48	Btu/F-sqft-hr
	Replacement Window Solar Heat Gain Coefficient	0.62	na
	Replacement LowE Window U-Value	0.34	Btu/F-sqft-hr
	Replacement LowE Window Solar Heat Gain Coefficient	0.42	na
	Retrofit Storm Window Emittance	0.82	na
	Retrofit Storm Window Solar Heat Gain Coefficient	0.895	na
	Retrofit Window Film Surface Emittance	0.84	na
	Retrofit Window Film Solar Heat Gain Coefficient (incl frame)	0.49	na

These two need to be updated based on what you are typically installing.

3.7. FUEL COSTS

Setup Library Information | Key Parameters | Fuel Costs

Fuel Cost Table Name: Default Costs

Comment: Average National Fuel Costs

	Fuel Type	In Units of	Unit Cost	Heat Content (MMBtu)
▶	Natural Gas	Mcf	14.230	1.000000
	Oil	Gallon	3.710	0.140000
	Electricity	kWh	0.110	0.003413
	Propane	Gallon	2.600	0.090000
	Wood	Cord	133.000	20.200000
	Coal	Ton	160.000	21.000000
	Kerosene	Gallon	3.710	0.130000
	Other	MMBtu	6.250	1.000000

FUEL COSTS

by Name: [dropdown]

1 of 1 | Copy | Del

Fuel Cost Table Name should have, at the minimum, the agency name and date of creation.

Usually one Fuel Cost Library is enough. More than one may be useful if an agency serves an area in which significantly different fuel costs are encountered.

If so, press **COPY** and change only the cost(s) that are different. Each Fuel Cost Library should be carefully named for the county and/or utility provider so that the auditor knows which library to choose for any given audit.

1. Correct fuel costs are essential for correct NEAT results. It is with these costs that NEAT converts its heat loss calculations into dollars, from which the SIR is calculated.
2. These costs must be updated with application at beginning of program year.
3. Costs can best be determined from utility bills. Add all per unit fees and surcharges (i.e., per KWH or per CCF, etc....) and add the appropriate tax to get the most accurate fuel costs. Do not include fixed monthly charges.
4. Note that Natural Gas must be input as Mcf.
 - a. Convert cost per CCF to Mcf: multiply CCF by 10
 - b. Convert cost per therm to Mcf: multiply them by 10.25
5. State average fuel costs will be used by all agencies.
 - a. For program year 2020, use fuel prices from [Appendix G](#).
 - b. Agencies wishing to modify state fuel prices based on local costs must request permission from ODOC before any changes are allowed.

3.8. LIBRARY MEASURES

Uncheck measures in this column for any measure that should **NOT** be considered.
Follow state rules.

Life Expectancy of a measure should be adjusted based on current State rules only

#	Measure Type	Measure Name	Active	Default Contractor	Default Cost Center	Life (yr)	Costs
1	Building Insulation	Attic insulation R11	<input checked="" type="checkbox"/>			25	Costs
2	Building Insulation	Attic insulation R19	<input checked="" type="checkbox"/>			25	Costs
3	Building Insulation	Attic insulation R30	<input checked="" type="checkbox"/>			25	Costs
4	Building Insulation	Attic insulation R38	<input checked="" type="checkbox"/>			25	Costs
5	Building Insulation	Attic insulation R49	<input type="checkbox"/>			25	Costs
6	Building Insulation	Fill ceiling cavity	<input checked="" type="checkbox"/>			25	Costs
7	Building Insulation	Sillbox insulation	<input checked="" type="checkbox"/>			20	Costs
8	Building Insulation	White roof coating	<input type="checkbox"/>			7	Costs
9	Building Insulation	Foundation wall insulation	<input checked="" type="checkbox"/>			20	Costs
10	Building Insulation	Floor insulation R11	<input checked="" type="checkbox"/>			20	Costs
11	Building Insulation	Floor insulation R19	<input checked="" type="checkbox"/>			20	Costs
12	Building Insulation	Floor insulation R30	<input checked="" type="checkbox"/>			20	Costs
13	Building Insulation	Floor insulation R38	<input checked="" type="checkbox"/>			20	Costs

Record: 1 of 45

Unit Costs for Measure: 11) Floor insulation R19				
	Description	Type	Units	Unit\$
▶	Floor Insulation -Fiberglass Batts - R-19	Insulation	SqFt	0.38
		Labor	SqFt	0.50
		Other	Each Floor	0.00

- For every (active) measure in the Library Measures list, you must input:
 - Material cost and Labor cost: These can be separated or combined. If combined, you must input a zero (0) in one of the boxes and the total cost in the other.
 - All measures must include both labor and material cost, whether combined or separated.
 - Other Cost: this is a flat per job cost. Basically, a setup cost that is constant regardless of the size of the job. Optional.
- When a new material is created in the NEAT Insulation Types section that material will appear in the Unit Cost list for the appropriate measure. It will show up with a default cost of **\$9999** and will not be an option until a more reasonable price is calculated and input.
- All typical costs for a measure should be included when calculating the measure cost. For example, rulers and flags for attic insulation are added to every job and should be included.
- The following measures must be de-activated (unchecked).

NEAT Turned off measures:

- 8 - White Coat Roofing
- 17 - Window Sealing
- 20 - Window Replacement
- 22 - Window shading (awning)
- 23 & 24 - Sun Screen Fabric or Sun Screen Louvered
- 25 - Window Film
- 26 - Thermal Vent Damper
- 27 - Electric Vent Damper

- 28 & 29 - IID & Electric Vent Damper IID
- 30 - Flame Retention Burner
- 34 - High Efficiency Boiler (unless pre-existing)
- 35 - Smart Thermostat
- 38 - Evaporative Cooler (unless pre-existing)

MHEA turned off measures:

- 26 & 27 - Window sealing (unless pre-existing)
- 30 & 31 - Plastic Storms (unless pre-existing)
- 34 & 35 - Awnings
- 36 & 37 - Shade Screen
- 38 – Setback Thermostat
- 40 - Evaporative Cooling (unless pre-existing)

3.9. NEAT INSULATION TYPES

1. NEAT Insulation Types must be set up as follows¹³:

Setup Library Information Key Parameters Fuel Costs (2) Fuel Price Indices Library Measures User Defined Measures (4) NEAT Insulation Types									
Attic			Knee Wall			Wall			
Type	Name	Rs/Inch	Type	Name	R-Value	Type	Name	Value	Units
Type 1	Blown Cellulose	3.75		Fiberglass Batts	13		Blown Cellulose	3.71	R/in
Type 2	Blown Fiberglass	3.09		Fiberglass Batts/R19	19		Fiberglass Batts/R13	13	R
Type 3	EPS Rigid Foam	3.8		EPS Foam Board/R13	13		Fiberglass Batts/R19	19	R
Type 4	XPS Rigid Foam	4.8		EPS Foam Board/R19	19		Blown Fiberglass	4	R/in
Type 5	Fiberglass Batts	3.2		XPS Foam Board/R13	13				
Type 6	2 Part Spary (Frothpak)	6.6		XPS Foam Board/R19	19				
Floor			Sill			Foundation Wall			
Type	Name	Rs/Inch	Type	Name	R-Value	Type	Name	R-Value	
Type 1	Fiberglass Batts	3.2		Fiberglass Batts	19		Rigid Foam Board	5	
Type 2				EPS Rigid Foam	19		XPS Rigid Foam	5	
Type 3				XPS Rigid Foam	19		2 Part Spray (Frothpak)/R13	13	
Type 4				2 Part Spary (Frothpak)	13				
Type 5									
Type 6									

2. Note that there are two changes from ODOC WPN 19-2. The R-value for blown fiberglass in walls is changed from R10 to R4 per inch, and R-49 is now an allowable measure. WPN 20-2 will address this.
3. Boxed Insulation types cannot be altered except to change their insulation value.
4. All other blanks are designed to allow the introduction of new insulation materials into the NEAT. This does not work on MHEA.
5. Note that none of the above added insulation types will be active until their price is changed in the COSTS of Library Measures from the default \$9999 to something more reasonable.
6. After costs are adjusted, the new insulation materials will show up as part of the dropdown choices for each appropriate shell measure.

¹³ ODOC WPN 19-2

3.10. SUPPLY LIBRARY

1. Typically used for only 2 things. The details input here provide the choices for replacement options in NEAT/MHEA for Refrigerators and DHW:

Supply

Supply Name: ODOC Supply Library 2020

References

Hot Water Equipment (5) | Insulation (0) | Labor (0) | Lighting (0) | Miscellaneous Supplies (0) | Refrigerators (2) | Windows (0) | Other (0)

Cooling Equipment (0) | Construction Materials/Hardware (0) | Doors (0) | Heating and Safety Items (0) | Heating Equipment (0)

Supply Name: ODOC Supply Library 2020

Agency: ODOC | State: OK

Description: General library 2020

Comment: ddd

2. Only 1 Supply Library should be required.
3. Energy details of each replacement must be accurate otherwise NEAT will make incorrect choices. Prices can be adjusted in the audit, if needed, but not energy details.
4. Most important details are the Energy Factor for water heaters and the KWH per Year for refrigerators. You can find correct details by checking hardware or appliance store websites for relevant appliances or talk to your purchasing agent.
5. Typical Water heater details (use exact details for audit, these are examples):
 - a. Electric: Energy Factor 0.93, Recovery Efficiency 99%, Input 4.5 KWh
 - b. Gas: Energy Factor 0.64, Recovery Efficiency 75%, Input varies (roughly 30-100 KBTU)
6. Typical refrigerator details (use exact details for audit, these are examples):
 - a. 18 Cu Ft: approximately 350 KW/yr.
 - b. 21 Cu Ft: approximately 475 KW/yr.

Description: 30g Electric Tank

Manufacturer: Any | Model: Any | Supplier: [dropdown]

Units: Each | \$/Unit: \$700.00

EnergyDetails >>

Fuel Type: Electricity | Energy Factor: 0.93

Capacity: 30 | Recovery Efficiency: 99

Input Units: [dropdown] | Life (yr): 15

Input: [text box]

Press this button to show Energy Details

Typical EF for water heaters:

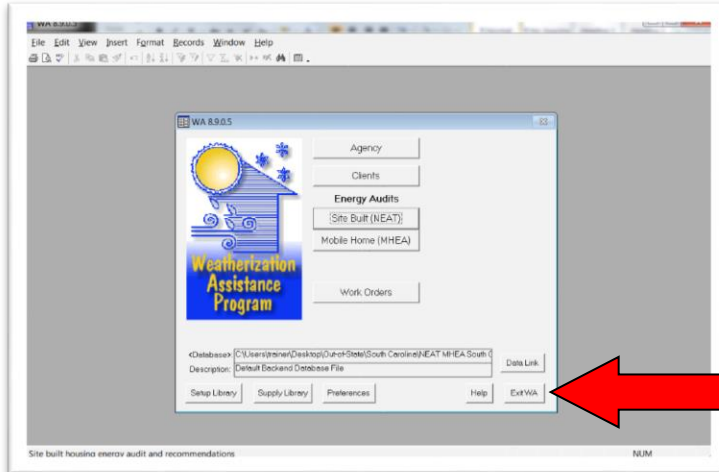
0.93 for standard electric

0.64 for standard NG

3.11. STARTING IN NEAT/MHEA



1. Open using this logo on your desktop screen



Always close the program using the button **Exit WA**. If you do not, there is some chance that the work you have done will not be saved.

AGENCY Tab – To create or modify your agency data

CLIENT Tab – To create or modify client data

SITE BUILT (NEAT) – To enter or view data for an audit of a site-built home

MOBILE HOME (MHEA) – To enter or view data for an audit of a manufactured home

SETUP LIBRARY – Source of Measure Costs, Fuel Costs, Replacement Equipment Efficiencies, etc...

SUPPLY LIBRARY – Source for prices of replacement Fridges and Water Heaters. More functionality is possible but rarely used.

DATA LINK – To input/export client files; Also, to change Database (Library)

PREFERENCES - To alter certain preferences including Range Check and Report Sections

NEAT MHEA Master Rule # 1

With the cursor blinking in any input box in NEAT or MHEA, press **F1**
This will provide HELP specific to what that input box is looking for.

3.12. AGENCY TAB

NEAT MHEA Master Rule # 2

Inputs boxed with a black line are **mandatory** inputs.
If the box is not bordered with a black line, then the input is not mandatory.

Enter your name under Contacts
and check yourself as Auditor. This
will allow you to “sign” your audits

The screenshot shows the 'Agency' form in the WA 8.9.0.5 application. The form is divided into several sections: 'Agency Information', 'Contacts (0)', 'Cost Centers (0)', 'Surveys (0)', 'Clients (0)', 'Audits (0)', 'Work Orders (0)', 'Libraries (0)', and 'Status History'. The 'Agency Information' section includes fields for 'Agency Name' (with a black border), 'State' (dropdown), 'Address', 'City', 'State' (dropdown), 'Zip Code', 'Phone Number', 'Fax Number', 'E-Mail', and 'Web Page URL'. There is a checkbox for 'Default agency to associate with new Client, Work Order, Library, and Supply records. Checking this will automatically UNcheck this box for all other Agency records (ie. Only one Agency record can be the Default record)'. At the bottom, there is a 'REPORT' section with a 'Select Report' dropdown and 'Preview' and 'Print' buttons. A red arrow points from a text box above to the 'Agency Name' field. Another red arrow points from a text box to the 'Close Here' button (a red X in a circle) at the top right of the form. A third red arrow points from a text box to the 'by Name' dropdown in the 'AGENCY' section at the bottom left. A fourth red arrow points from a text box to the 'Web Page URL' field.

Unless you are working for more than one single agency, only one record is needed. Look on the lower left corner of the page to determine how many agency records you have on your database. If there is more than one, make sure that your primary agency is checked as DEFAULT. Only one agency should be checked as DEFAULT.

Close the page by clicking on the red X at the top right corner of the Agency box.
You do not need to SAVE.

3.13. CLIENT TAB

DO THIS FIRST: Press the **NEW** button to create a new client. Not creating a NEW record means that you will be overwriting the data of an existing client.

The screenshot shows the 'Client' tab in the NEAT/MHEA software. Red arrows and boxes highlight key features:

- Type Client Name or Job #:** Points to the 'Client ID' field containing 'Ann Whitehead'.
- Input the number of Occupants. This data affects calculations for water use and Cooling Load.**: Points to the 'Occupants (number of)' field, which is set to 3.
- Close Here:** Points to the 'X' button in the top right corner of the window.
- State:** Points to the 'State' dropdown menu, which is set to 'US'.
- CLIENT Section:** Points to the 'CLIENT' section at the bottom left, which includes search filters and a 'New' button.

The interface includes various input fields for client information, a 'Dwelling' section with dropdowns for Type and Ownership, and a 'REPORT' section with a 'Select Report' dropdown.

NEAT/MHEA Master Rule # 3

Note the downwards arrow in the right edge of some input boxes.

That designate this as a dropdown List.

You can only choose from items in this dropdown list.

To speed things up, you can type the first letter(s) of the choice you wish to make.

1. Ensure that the appropriate agency and Setup Library are chosen. If you have only one of each, this will occur automatically.
2. Enter the **TYPE** of the dwelling: Choose from the dropdown list.
3. If desired, go to the **CONTACTS** tab to enter client name, address and phone number.

3.14. SITE BUILT (NEAT) ENERGY AUDITS

1. Audit Information

DO THIS FIRST:

Press the **NEW** button, at the bottom left of the screen, to create a new audit.

Not creating a NEW record means that you will be overwriting the data of an existing audit.

Choose the client for whom you want to create an audit from the dropdown list

Comments can include a brief description of home or other helpful information

The screenshot shows the NEAT Energy Audit software interface. The 'Audit Information' tab is active. The 'Client ID' dropdown is circled in red, with an arrow pointing to it from the text 'Choose the client for whom you want to create an audit from the dropdown list'. The 'Comment' text area is also circled in red, with an arrow pointing to it from the text 'Comments can include a brief description of home or other helpful information'. The 'Run Audit' button is visible on the right. The 'Economics Summary' box shows 13 measures recommended, a total initial cost of \$6,673.93, and a cumulative SIR of 2.44. The 'AUDIT' section at the bottom left has a 'New' button circled in red. The 'REPORT' section at the bottom right shows 'Recommended Measures' selected.

2. Under Auditor, choose yourself from the dropdown of auditors.
3. Make sure <Setup Library>, <Fuel Cost Library> and <Supply Library> boxes are all populated. If not, choose the appropriate ones from the dropdown.
4. Choose the Weather File. You can use the dropdown, or if you know the code for the city you wish to choose, you can type the first few letters until you see the city of your choice.
5. The WEATHER LOCATION city you choose will not always be the geographically closest city to your client. It might even be in another state. You are looking for the weather file that most closely approximates the Heating Degree Days (HDD) and Cooling Degree Days (CDD) of your client's location.
6. Conditioned Stories. Input the number of conditioned stories in the home. Think Stack Effect: What is the distance from the lowest point air might enter the home to the highest point air might leave. Must be input in terms of stories, each about 8'.

Input only 1; 1.5; 2; 3 or 4 floors

1 story = about 8'-9'

1.5 story = about 12'-13'

2 story = about 16'-18'

3 story = about 24'-27'

4 story = about 32'-36'

- a. Therefore, a conditioned basement counts as a story so long as that basement is either mostly above grade and/or has a door directly accessing the outdoors.

7. Floor Area. Input the total square footage of ALL conditioned floor areas in the home. The value is total floor area, not footprint area, (e.g. enter 2400 for a two story house with 1200 square feet in each story).
8. Billing Adjustment, if checked, will allow the model to be modified by the utility data you can optionally input under the Utility Bills Tab.
9. Impute Cooling implies that there is a cooling load in the home that cannot be defined under the Cooling tab. It also allows the possibility that a new AC can be recommended even when none currently exist. Do Not Check This Box.

NEAT/MHEA Master Rule # 4

The **ESCAPE** button (top left of most keyboards)
Use this button to “escape” when NEAT prevents you from moving out of a record.

It is needed most commonly when:
(1) You have mandatory but empty inputs on a page but wish to back out,
(2) You cannot proceed due to an error with repeated (window) codes

3.15. ENTERING SHELL DATA

1. This is where we input all the data for the physical characteristics of the home. Note that there are six sub-tabs under the Shell tab. It is recommended that you complete each sub-tab before proceeding to the next.

3.16. WALLS

The screenshot shows the NEAT Audit software interface. The 'Walls' tab is active, displaying various input fields for wall data. A red box with an arrow points to the 'Windows on this Wall' and 'Doors on this Wall' buttons, with a text box stating: 'Don't use these buttons. It is far more helpful to finish all walls first and then move on to the Window and Door tabs'.

1. Input a unique Wall Code for each wall. Try to keep the codes for all walls sequential and matching the codes you wrote on your footprint diagram, so that anyone can easily determine which wall is referenced by each Wall Code.
2. Define the Wall Type of the home. Use the dropdown to make your selection or type the first letter of the type you want to choose.
3. Stud Size will show up for wood framed homes only and will, by default, show up as 2x4. Change this if necessary.
4. Exterior Type. What is the siding type of this home? Choose from the dropdown.

5. Is the wall you are describing exposed To:
 - a. Outside (Ambient)
 - b. Buffered Space: This refers to an unconditioned space that buffers this section of wall from the outside. Typically to consider a space buffered, the air in the buffered space will have a temperature at least several degrees different from the outside ambient temperature.
 - c. Attic Space: This is usually the top triangular section of wall in a cathedral or vaulted space that is adjacent to unconditioned attic. It is treated the same in NEAT as a knee wall.
 - i. A small glitch with the software... If choosing a wall adjacent to ATTIC SPACE, NEAT will not provide you insulation for that wall if it is uninsulated. If that is the situation, instead model this section of wall as a Knee Wall under Finished Attics. Do not model it in both places. Choose one only.
6. What is the Orientation of this wall? Choose one: N-S-E-W.
7. Calculate the Gross Area of this wall. It is the width of the wall x the ceiling height. If the home is two or more stories, you can calculate the wall area as the width x the full height of all floors combined. Or model the walls of different floors as separate walls. Comment on the procedure used.
8. Measure #. This number should stay the same for every wall that has all the same essential structural characteristics such as framing type and existing insulation. Buffered and Outside walls can share the same measure number. Choose a new measure number for a wall that, for example, is insulated while other walls are not. You can choose to make all walls their own measure if you wish.
9. Input the Type and R-Value of Existing Insulation.
 - a. One wall minimum of each home must be inspected for insulation levels. If there is an addition, the addition walls must also be inspected.
 - b. Best practice: drill a 1" hole (or bigger) in an exterior wall, preferably in a closet or from outside; examine cavity and seal with a plastic plug & caulk. Take photos of each wall hole being inspected.
 - c. R11 vs R13: This is very difficult to determine. Base your assumption on when the house and/or addition was built. R11 was used only until about 1995.
10. In most cases, there will be no Additional Cost. This is to be input if there is an unusual and unique extra cost to insulate this particular wall that is beyond the price defined in the Library. Examples could include the extra cost to blow insulation from the inside; or a repair to the siding that is necessary before insulation can be added.
11. Do not include H&S costs such as LSW.
12. To input a new wall, there are two choices. In the lower left hand of the screen, choose NEW to create a blank record; or choose COPY to copy all the data of this wall to a new record. If COPY is chosen, be sure to change the Wall Code, so that all wall entries remain sequential and match the numbering on the footprint diagram. Then change only those fields that are different from the previous wall.

3.17. WINDOWS

1. Input a unique Window Code for each window. Try to keep the codes for all windows sequential and matching the codes you wrote on your footprint diagram, so that anyone can easily determine which window is referenced by each Window Code.
2. What is the Window Type? Choose the appropriate selection from the dropdown list.
3. Choose the appropriate Frame Type and Glazing Type from the dropdown list.
4. Choose the appropriate Interior Shading from the dropdown list or ignore this input.
5. Exterior Shading %. This input asks you to judge the amount of shade provided by trees or shrubs; and by such things as roof eaves, nearby buildings and porch roofs. It does **NOT** ask you to consider what orientation the wall is facing. This must **NOT** be input as the default 20% across all windows. Each window, or in some cases, multiple windows on one wall, must be inspected and the amount of exterior shading determined.
6. Choose the most appropriate Leakiness level for this window. This is always a judgment call but try to back up your claim with photos, especially if you are defining the window as Very Loose. This refers only to the body of the window itself, not to the glass. A broken pane of glass is much cheaper to replace than a whole window and will be dealt with as an Infiltration issue.
 - a. Press F1 for more information.
 - b. A functional storm window can be considered to provide some air sealing. Set the leakiness of the window one level higher than you would were the storm window absent.
7. Average Size. Input the Width and Height of the window you are defining. It is not recommended to average the size of multiple similar windows.
8. Wall Code. Choose from the dropdown the Wall Code for the wall on which this window exists.
9. Number. This input allows you to define how many windows of the exact same characteristics exist on this wall. It is recommended to leave this number always as '1', and to create a unique record for each window, even if they are identical.
10. Retrofit Options. Choose Evaluate All in all cases unless there is some rare particular reason to not do so. If choosing anything other than Evaluate All, explain in the comments why you made that choice and seek State approval.
11. In most cases, there will be no Additional Cost. This is to be input if there is an unusual and unique extra cost to apply a weatherization measure to this particular window that is beyond the price defined in the Library. Examples could include the extra cost to remove and reattach security bars that cover the window; or repairs necessary to the window frame to allow the replacement of the window. This should not include LSW costs.
12. To input a new window, there are two choices. In the lower left hand of the screen, choose NEW to create a blank record; or choose COPY to copy all the data of this window to a new record then change only those fields that are different from the previous window.

3.18. DOORS

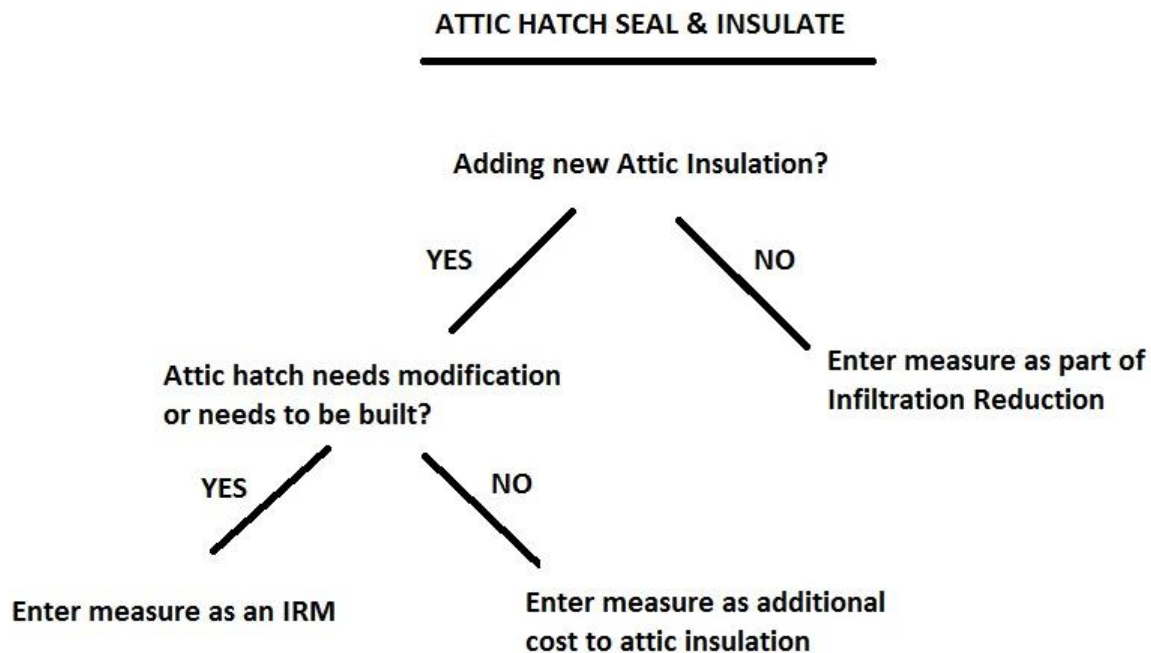
1. A Door Code must be input. Type in your own (the Tab function does not work here)
2. Choose the appropriate Door Type from the dropdown list.
3. Calculate the area of the door in square feet. Doors are typically measured in inches, so use the following equation:

$$\text{Width (in)} \times \text{Height (in)} / 144$$
4. Choose the appropriate Storm Door Condition from the dropdown list. Remember: the storm door is considered only due to its help in blocking air movement. If the storm door doesn't block air flow, then it should be considered Deteriorated or None.
5. Choose the appropriate Leakiness from the dropdown list.
 - a. Tight = door doesn't need any work
 - b. Medium = door good but needs weather-strip and/or door sweep
 - c. Loose = Door cannot be air sealed. Door is warped, rotted or broken.
6. Wall Code. Choose the Wall Code for the wall on which this door exists.
7. Number. It is recommended to leave this number always as '1'.
8. Optional Dimensions can be input but will be ignored by NEAT.

3.19. UNFINISHED ATTICS

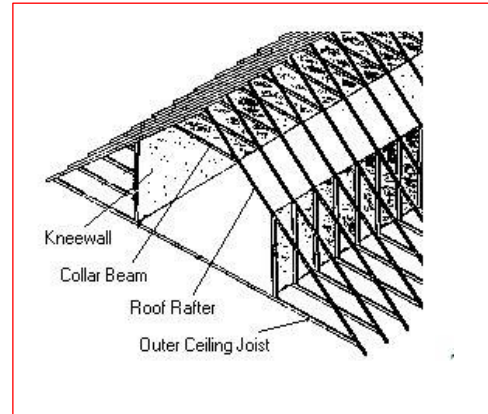
1. An Attic Code must be input.
2. Choose the appropriate Attic Type from the dropdown list.
3. The default Joist Spacing is 24", which you can achieve by hitting the TAB key. NEAT does not consider this number so use the default or put in actual. It makes no difference.
4. Define the Area of the attic. In many homes, this will be the same as the conditioned area of a single-story home. If there are multiple attics, the sum of all attics must equal the area of the floor above which the attics sit.
5. The Roof Color is almost always Normal or Weathered. Choose White, Reflective, Shaded only if the roof color is clean enough to effectively function as a white or reflective roof (or its primarily in shade all the time)
6. Choose the Type and Depth for the Existing Insulation in the attic. Note that Depth is in inches, not in R-Value. If the insulation is degraded; or there are many gaps; or it is very uneven, calculate (or estimate) the actual R-Value and convert that back into inches (Roughly, 1 inch = R3.5). If this is done, explain in the Comments.
 - a. Useful link to calculate weighted average: <https://www.redcalc.com/parallel-path-r-value/>
7. If there is more than one type of existing insulation, choose the type that seems to be in the majority. Combine them together when calculating depth and mention in Comments.
8. Added Insulation: Choose Measure # 1. If there is more than one attic, each must have its own measure number.
9. Choose the appropriate Added Insulation Type from the dropdown list. Typically, blown fiberglass is added on top of existing fiberglass.
10. In most cases, it is optimal to leave inputs for Added R-Value and Max. Depth blank.
 - a. Added R-Value is a mandatory input that forces NEAT to provide the requested R-Value of insulation regardless of SIR. It will show up in the Recommended Measures as User-Spec Ceiling, even if the SIR is below 1.0. This should be used carefully, if at all.
 - b. Max. Depth MUST BE INPUT for attics that are floored or cathedral, or any other circumstance when the depth is limited by the width of the joist. Input the total floor joist or roof rafter width. Do not use this input for any open attic space.
11. With attics, there will usually be Additional Costs. All additional costs must be explained in the comments.
 - a. These are typical Additional Costs:
 - i. Dams for hatch, flue pipes and/or separating attic areas
 - ii. Baffles (only if soffit vents exist)
 - iii. Extra time to maneuver through a tight attic area
 - iv. Labor cost to remove client's stored goods
 - v. Cost to insulate and air seal an existing attic hatch
 - vi. Blocking of joist cavities under floored attics

- b. The following are NOT Additional Costs:
- vii. Air sealing in the attic (this should be part of air sealing only)
 - viii. New attic ventilation (this should be an Incidental Repair)
 - ix. Flags and rulers (these should be included in the per square foot cost)
 - x. Building a new attic access (this should be an Incidental Repair)
 - xi. Roof repairs (this should be an Incidental Repair)
- c. If there is more than one attic, press NEW at the lower left of the screen to create a new record. All attic spaces in a home must be modeled.
- i. NOTE: An attic that is partly floored must be input as two attics, one floored and one un-floored with appropriate square footage for each.
- d. How to input an attic hatch measure:



3.20. FINISHED ATTICS

The screenshot shows the NEAT Audit software interface. At the top, there's a header with 'Audit Name: Ann Whitehead', 'Client ID: Ann Whitehead', and 'Client Name:'. Below this is a navigation bar with tabs like 'Status', 'Shell', 'Heating (2)', 'Cooling (2)', 'Ducts/Infiltration', 'Baseloads', 'Health & Safety', 'Itemized Costs (2)', 'Utility Bills (0)', 'Photos (0)', and 'Measures (13)'. The main window has a tabbed interface with 'Walls (4)', 'Windows (8)', 'Doors (2)', 'Unfinished Attics (1)', 'Finished Attics (0)', and 'Foundations (1)'. The 'Finished Attics' tab is active, showing a form for adding a new record. The form includes fields for 'Attic Code', 'Attic Area Type' (with a dropdown menu), 'Attic Floor Type', 'Area (sq ft)', and 'Roof Color'. There are also sections for 'Existing Insulation' and 'Added Insulation' with various sub-fields. A red arrow points from the 'Attic Area Type' dropdown menu to a diagram of a finished attic structure on the right.



1. A unique Attic Code must be input for each record
2. Attic Area Type. Most Finished Attics have all four elements that are described here, and each type must be modeled individually (using the NEW button at the bottom left to create a new record for each). However, to save time, it is acceptable to combine the square footage of both areas of the same type (say, both Knee walls, and both Roof Rafters) into a single record.
 - a. Use the F1 Key if you need help to understand what each element describes.
3. All inputs here are essentially the same as on the Unfinished Attics page. Three things to note:
 - a. When modeling the Roof Rafters, you must input Max. Depth. Use the width of the Rafters (usually 6 or 8").
 - b. The Outer Ceiling Joists are understood by NEAT to be unconditioned space. Do NOT model this area as a separate attic under Unfinished Attics.
 - c. If a measure is not provided ($SIR < 1.0$), you may want to try and choose a cheaper insulation option instead.
4. Choose a separate measure number for each element of a finished attic.
5. The gable end walls of a typical finished attic must be modeled as exterior walls under the Walls tab.

3.21. FOUNDATIONS

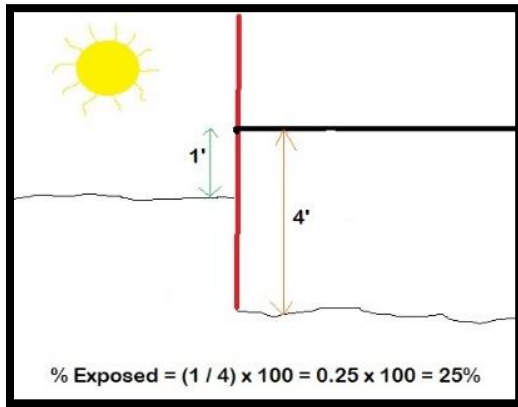
The screenshot shows the NEAT Audit software interface. The top navigation bar includes tabs for Audit Information, Status, Shell, Heating (2), Cooling (2), Ducts/Infiltration, Baseloads, Health & Safety, Itemized Costs (2), Utility Bills (0), Photos (0), and Measures (13). The Foundations (1) tab is selected. The main form area contains the following sections:

- Foundation Code:** 1
- Foundation Type:** Vented Non Conditioned
- Measure #:** 1
- Floor:**
 - Area (sq ft): 700
 - Added Insulation Type: Fiberglass Batts
 - Existing Insulation R Value: 0
 - Additional Cost (\$):
- Sill:**
 - Floor Joist Size (in): 10
 - Added Insulation Type: Fiberglass Batts
 - Perimeter to Insulate (ft): 110
 - Additional Cost (\$):
- Foundation Wall:**
 - Height (ft): 4
 - Perimeter (ft): 110
 - Added Insulation Type: Rigid Foam Board
 - Height Exposed (%): 50
 - Existing Insulation R Value: 0
 - Additional Cost (\$):

At the bottom, there is a table titled "FOUNDATION" with columns for Foundation Code, Area, and Perimeter. The first row shows Foundation Code 1, Area 700, and Perimeter 110. There are also buttons for "Run Audit", "Last Run On" (8/26/2014), and "at" (3:08 PM).

1. A unique Foundation Code must be input for each foundation area.
2. Choose the appropriate Foundation Type from the dropdown list.
 - a. Conditioned: A conditioned space is heated and/or cooled either directly, or indirectly through a permanently open doorway.
 - b. Non-Conditioned: Unvented and non-conditioned. Usually a non-conditioned basement. Could be a closed crawlspace also.
 - c. Vented Non-Conditioned: This is a typical vented crawlspace. If there are foundation vents, it is vented.
 - d. Unintentionally Conditioned: Be wary of choosing this. For this to be true, you must reasonably believe that the entire space is heated at least 1 degree due to the waste heat from the furnace, boiler and/or water heater.
 - e. Uninsulated or insulated slab: Always choose Uninsulated unless you know otherwise.
 - f. Exposed Floor: This is an overhang (such as a cantilevered floor) or the foundation of a house that sits on stilts or piers.
3. Choose a unique Measure # for each foundation.
4. Floor - Area. Input the square footage of the foundation.
5. Define the Existing Insulation R-Value here and for Foundation Wall. Use '0' for none.
6. Choose the appropriate Added Insulation Type from the dropdown list. Do this for all 3 elements of most foundation types (Do not choose NONE)
7. Sill – Floor Joist Size. Input only the blank: 2 x ___? ___
8. Perimeter to Insulate. Perimeter is the sum of the lengths of all the foundation walls. Do not use the TAB key. This should be calculated from the footprint diagram. You can input this same number for Foundation Wall Perimeter. Enter only uninsulated perimeter.
9. Foundation Wall – Height. This is the height from the subspace floor, or crawlspace ground, to the bottom edge of the floor joists. If the floor is uneven, estimate an average height over the whole area. Do NOT input the minimum height measured in the crawlspace.

10. Height Exposed is the percentage of the Foundation Wall Height that is above grade.



11. MULTIPLE FOUNDATIONS: A home may have more than one foundation. All foundation areas must be modeled.
- Example 1: the floor of a bonus room over a garage must also be input as a foundation if the bonus room is part of the home's conditioned space.
 - Example 2: additions often have a separate foundation that could be the same or a different type as the main house.
12. SPLITTING A SINGLE FOUNDATION: It is acceptable to model a single foundation as two.
- Example: If part of the previously insulated floor is in good condition and the other is in need of new insulation, model as two foundations – one insulated and one not. Use the appropriate square footage for each area, so long as the total is true to the actual area of the foundation.
13. PARTIALLY INACCESSIBLE CRAWLSPACE: Many crawlspaces in Oklahoma have significant areas that have a height below 2 feet.
- Document, on Form 28 and in the NEAT, the total area of the crawlspace and the approximate area that is below 2 foot height.
 - Use the above example to model the accessible crawlspace as a separate crawlspace.
14. If there is more than one foundation, press NEW at the lower left of the screen to create a new record. All foundation spaces in a home must be modeled.

3.22. HEATING

NEAT Audit

Audit Name: Client ID: Client Name:

Audit Information | Status | Shell | Heating (2) | Cooling (2) | Ducts/Infiltration | Baseloads | Health & Safety | Itemized Costs (2) | Utilities (13)

System Code: Heat Supplied (%): Primary System: ☒

Equipment Type: Manufacturer: Model:

Fuel: Location:

Uninsulated Supply Ducts (0)

Required Heating System Details

GAS FURNACE DETAILS

Input Units: Input Rating:

Output Capacity: (kBtu/hr)

Steady State Efficiency: (%)

Condition: Programmable Thermostat: ☐

Automatic Vent Damper: Present ☐ Evaluate ☐

Pilot Light/IID: IID ☐ Pilot Light ☒ On in Summer ☒ Power Burner ☐

Replacement System

Options: Fuel:

	Standard	High Efficiency
System AFUE	<input type="text" value="80"/>	<input type="text" value="90"/>
Labor Cost (\$)	<input type="text" value="\$900.00"/>	<input type="text" value="\$900.00"/>
Material Cost (\$)	<input type="text" value="\$1,200.00"/>	<input type="text" value="\$1,200.00"/>

Optional Heating System Details: ☐ Operational Tests: ☐ Vent Tests: ☐ Furnace Components: ☐ Boiler Components: ☐ Inspections: ☐ Thermostat: ☐

HEATING SYSTEM

by System Code: of New Copy Del

Comment:

Run Audit Last Run On: 8/26/2014 at 3:08 PM

- Note that inputs here are for functioning heating systems.
- If the primary heating system is non-operational, there are three options:
 - If a replacement system will be installed using funds from another funding source, model the new system as the existing unit and note this in the Comments. You may have to estimate efficiency and size of new unit.
 - If a replacement system will be installed using DOE or DHS LIHEAP H&S funds, model the existing broken furnace and choose Replacement Mandatory (do NOT Include in SIR). Explain the reason for this replacement in Comments.
 - To attempt an ECM replacement: Model the heat that exists and is functional. It can be as little as a few space heaters, or even just an oven. There is no minimum to what truly exists. Choose Evaluate All and enter appropriate replacement data.
- If the unit is working but will be replaced as H&S, choose option b. from above.
- Choose the appropriate Equipment Type from the dropdown list. Note the following:
 - Both Vented and Unvented Space Heaters refer to combustion heaters.
 - Wood stoves are vented space heaters.
- Choose the appropriate Fuel Type and Location from the dropdown lists.
 - OTHER fuel type shall be chosen for wood pellets only.
- Heat Supplied is the percentage of the home's conditioned floor area that is heated by this unit. If there is more than one unit, estimate the percentage from each. The total must add up to 100.
- Enter the Manufacturer and Model # if desired.
- For Combustion Appliances:
 - Input Units and Input Rating are not used by NEAT except to input AFUE as SSE if no SSE measurement was taken at the job site. Not useful if you know the AFUE already.
 - Output capacity can sometimes be taken from the nameplate of the heating unit. Otherwise you must calculate based on the system type and Input Capacity
 - Output = Input x AFUE
 - Steady State Efficiency must be measured in the field. If this is not possible, then the AFUE can be entered instead. It is NOT allowed to input any other number as SSE.

9. Choose the appropriate Condition. This is used only to estimate SIR for tune-up. Note that the worst option you can choose is poor (BUT WORKING). See the beginning of this section for options when the heating system is broken.
10. Check the “Programmable Thermostat” box if the home has a Programmable Thermostat. This means that the thermostat not only CAN be programmed to setback for specific times but IS being used in that capacity. A digital thermostat is not necessarily programmable. Look carefully!
11. Automatic Vent Damper. Not typically used.
12. Pilot Light / IID. Check if it is an IID or Pilot light. Check, too, if the Pilot Light remains on throughout the summer.
13. Power Burner. Only for oil or coal fired systems that have been converted to gas.
14. For Electric resistance heat: Input either the KW (this can be combined for multiple space heaters) or KBTU per hr.
15. Multiple electric space heaters can be added together as a single input. Combine the wattage of each and input that value (in KW).
16. For Heat Pumps: Input the HSPF or the year of manufacture only.
 - a. Do not use Year Manufactured for any unit newer than 2008. The list has not been updated beyond efficiencies as they existed in 2008.
17. You can degrade the HSPF using the degrading formula ([Appendix D](#)).
18. Replacement System – Options. Choose Evaluate All (or equivalent option) unless a State exception is provided.
19. Note that fuel switches are not permitted. Contact ODOC for further guidance.
20. Both material and labor cost must be estimated but they do not need to be separated. You can put total cost in one box and put \$0 in the other.
21. Typical replacement efficiencies are:
 - a. Natural Gas & Propane: 80% standard; 90% High Efficiency.
 - b. Oil: 80% standard; 85% High Efficiency.
 - c. Heat Pump: 8 HSPF or higher. Be accurate based on actual unit to be installed.
22. Look back up to near the top right of the page of the audit software. Press the Uninsulated Supply Ducts button if there are uninsulated supply ducts or plenums that you wish to insulate.
23. If you input a secondary heating system, note that there will be a checkbox that, if checked, tells NEAT that this secondary system will no longer be used if a replacement of the primary unit is allowed. Check this only if client agrees to secondary heat removal.
24. OPTIONAL Heating System Details can be input but will not be used by NEAT in any calculation.
25. See [Appendix B](#) and [C](#) for help to determine efficiency of existing unit where manufacturer’s tag is missing, or data cannot be found online.
26. All new HVAC system installs must be correctly sized with Manual J and Manual S calculations¹⁴.
27. Complete calculations – based on post-WX description of home -must be provided by the HVAC contractor. Keep a copy in the client file.

¹⁴ ODOC WPN 19-3

3.23. COOLING

NEAT Audit

Audit Name **ann Whitehead** Client ID **Ann Whitehead** Client Name **ann Whitehead** Alt Client ID

Audit Information | Status | Shell | Heating (2) | Cooling (2) | Ducts/Infiltration | Baseloads | Health & Safety | Itemized Costs (2) | Utility Bills (0) | Photos (0) | Measures (13)

AC Code **A/C**

Equipment Type **Window or Room Air Conditioner**

Manufacturer

Model

Floor Area Cooled (sq ft) **400**

Capacity (kBtu/hr) **18**

Year Manufactured **1998**

Required Retrofits

Replacement Required ☐

Tune-up Mandatory ☐

Run Audit

Last Run On **8/26/2014**

at **3:08 PM**

COOLING SYSTEM

by AC Code **A/C**

1 of 2

New Copy Del

Comment

1. Choose the appropriate Equipment Type from the dropdown list.
2. Enter the Manufacturer and Model # if desired.
3. What is the Floor Area Cooled by this unit? If it is a ducted system, it will likely be every room in the home with the possible exception of rooms not supplied by the duct system.
4. Enter the Capacity of the unit in KBTU/hr. Remember that 1 ton is equal to 12 KBTU/hr.
5. Enter either the SEER or the Year Manufactured. Choose one.
 - a. Do not use Year Manufactured for any unit newer than 2008. The list has not been updated beyond efficiencies as they existed in 2008.
6. You can degrade the SEER using the degrading formula ([Appendix D](#))
7. If the unit being modeled is a Window AC, the efficiency will be given as EER. EER must be converted to SEER. The appropriate calculation is available by hitting the F1 key while the cursor is in the SEER box.
 - a. $SEER = (EER \times 1.2) - 0.7$

3.24. MANUFACTURED HOMES ENERGY AUDITS (MHEA)

Audit Information

DO THIS FIRST:

- a. Press the NEW button, at the bottom left of the screen, to create a new audit.
- b. Not creating a NEW record means that you will be overwriting the data of an existing audit.

Choose the client for whom you want to create an audit from the dropdown list

Comments can include a brief description of home or other helpful information

MHEA Audit

Audit Name: Susan Fowler Client ID: Susan Fowler Client Name: Susan Fowler

Audit Information | Status | Shell (13) | Addition (0) | Heating (2) | Cooling (2) | Ducts/Infiltration | BaseLoads | Health & Safety | Itemized Costs (2) | Utility Bills (0) | Photos (0) | Measures (12)

Audit Name: Susan Fowler Length (ft): 60

Client ID: Susan Fowler Width (ft): 14

<Agency Name>: NRCERT Exterior Wall Height (ft): 8.5

Agency State: US Wind Shielding: Normal Shielding

Auditor: SK Home Leakiness: Medium

Outdoor Water Heater Closet: ☒

Libraries and Other Options

<Setup Library>: VA Wx SETUP LIBRARY 6.1.2012

<Fuel Cost Library>: Default Virginia Costs 2012

<Supply Library>: VA Wx Supply Library 6.1.2012

Weather File: ROANOKVA.WX

Billing Adjustment: ☐

Comment:

Economics Summary

Measures Recommended: 12

Total Initial Cost (\$): \$4,865.80

Cumulative SIR: 1.20

REPORT

Select Report: Recommended Measures

Preview Print Snapshot File

AUDIT

by Audit Name: by Client ID:

by Client Name: by Alternate Client ID:

New Copy Del

1. Under Auditor, choose yourself from the dropdown of auditors.
2. Made sure <Setup Library>, <Fuel Cost Library> and <Supply Library> boxes are all populated. If not, choose the appropriate one from the dropdown.
3. Choose the Weather File. You can use the dropdown, or if you know the code for the city you wish to choose, you can type the first few letters until you see the city of your choice.
 - a. The WEATHER LOCATION city you choose will not always be the geographically closest city to your client. It might even be in another state. You are looking for the weather file that most closely approximates the HDD and CDD of your client's location.
4. Billing Adjustment, if checked, will allow the model to be modified by the utility data you can optionally input under the Utility Bills Tab.
5. Input the Length and Width of the original mobile home body only. If there are any additions, they are considered only in the Additions tab.
6. Input the Exterior Wall Height. This usually can be measured as the ceiling height inside the mobile home.
 - a. Typically, 7' or 7.5'.
 - b. If cathedral ceilings are present throughout the home, measure the height of the walls up to the beginning of the sloped ceiling.
7. Choose the appropriate Wind Shielding from the dropdown list.
8. Choose the appropriate Home Leakiness from the dropdown list. Note that this entry is disregarded by MHEA as soon as actual blower door data is input.
9. Check the box for Outdoor Water Heater Closet if the mobile home as an exterior access to the water heater closet. If checked, this will automatically reduce the volume of the home by the appropriate amount (about 60 cubic feet).

3.25. ENTERING THE SHELL DATA WALLS

MHEA Audit

Audit Name: Susan Fowler Client ID: Susan Fowler Client Name: Alt. Client ID:

Audit Information | Status | Shell (13) | Addition (0) | Heating (2) | Cooling (2) | Ducts/Infiltration | Baseloads | Health & Safety | Itemized Costs (2) | Utility Bills (0) | Photos (0) | Measures (12)

Walls (1) | Windows (8) | Doors (2) | Ceiling (1) | Floor (1)

Wall Stud Size: 2x6
Orientation of Long Wall: West
Wall Ventilation: Not Vented

Existing Insulation:
Batt/Blanket (in): 2
Loose Fill (in): 0
Foam Core (in): 0.5

Uninsulatable Wall Area (sq.ft): 0
Additional Cost (\$): \$0.00

Comment:

New Del

Carport/Porch Roof:
Length (ft): 18
Width (ft): 7
Orientation: East

Run Audit
Last Run On: 8/26/2014

The New/Delete buttons do not work in MHEA.
There is only one wall to be described here.

1. Choose the appropriate Wall Stud Size from the dropdown list. This can be determined by measuring the depth of a door frame.
2. Choose the appropriate Orientation of Long Wall from the dropdown list. This can be either direction, i.e., if the long wall faces East and West, then you can choose either East or West. Both would be correct.
3. Choose the appropriate Wall Ventilation from the dropdown list. In almost all cases, the appropriate response will be Not Vented. Vertically corrugated metal siding can be considered Vented.
4. Define the Existing Insulation. MHEA allows for the possibility that there is more than one type of insulation. Enter the thickness of each, with a 0 where there is none.
5. Input the uninsulatable Wall Area, if any. This would be an area of wall that cannot be insulated. This is rarely used.
6. If there is a carport or porch attached to the mobile home, input the Carport/Porch Roof – Length, Width and Orientation. Note that the Length should be the dimension that is parallel to the manufactured home.

3.26. WINDOWS

1. Input windows on the original manufactured home only, not on the addition (if any)
2. Choose the appropriate Window Type from the dropdown list. Unlike in NEAT, this is required.
3. Choose the appropriate Frame Type, Glazing Type and Interior Shading from the dropdown list.
4. Choose the appropriate Exterior Shading from the dropdown list. Note that there is no option to input the % shading, so a lot of auditor judgment is involved here.
 - a. If a window is partially shaded, the auditor must decide if this should be defined as NONE or AWNING.
 - b. The presence of a Low E film on the windows can be described here only.
5. Choose the appropriate Leakiness from the dropdown list. Press F1 for guidance.
6. Input the Width and Height of the window(s) being modeled
7. Number Facing. MHEA allows you to input every identical window on ANY wall in a single record. Each window modeled together MUST have EVERY characteristic except orientation the same. Enter 0 for any orientation that does not have one of these windows.
8. Retrofit Options. You are required to choose Evaluate All. Any other option requires State approval. Apply Additional Costs if necessary and this input should be explained in the comments section.

3.27. DOORS

MHEA Audit

Audit Name: Susan Fowler Client ID: Susan Fowler Client Name: Alt Client ID:

Audit Information | Status | Shell (13) | Addition (0) | Heating (2) | Cooling (2) | Ducts/Infiltration | Baseloads | Health & Safety | Itemized Costs (2) | Utility Bills (0) | Photos (0) | Measures (12)

Walls (1) | Windows (8) | Doors (2) | Ceiling (1) | Floor (1)

Door Code: DRI Type: Standard Manufactured Home Door

Storm Door Present: ☒ Replacement Door Required: ☐

Additional Cost (\$/door):

Size: Width (in): 36 Height (in): 78

Number Facing: North: 0 South: 0 East: 0 West: 0

by Door Code: 1 of 2 New Copy Del

Comment:

Run Audit

Last Run On: 8/26/2014 at 4:44 PM

1. Input doors on the original manufactured home only, not on the addition (if any).
2. Choose the appropriate Type from the dropdown list.
3. Check if a storm door is present. There is no ability to define the condition of the storm door, so if it is in poor condition, it is best to claim there is none. This must be mentioned in the Comments.
 - a. Storm Doors are only relevant in terms of their ability to limit air infiltration though the door. A security door does not count as a Storm Door.
4. Enter the Width and Height of the door.
5. Number Facing. As with windows, you can input every identical door on any wall within the same record. Each orientation requires an input even if that is 0.

3.28. CEILING

MHEA Audit

Audit Name: Susan Fowler Client ID: Susan Fowler Client Name: Alt Client ID:

Audit Information | Status | Shell (13) | Addition (0) | Heating (2) | Cooling (2) | Ducts/Infiltration | Baseloads | Health & Safety | Itemized Costs (2) | Utility Bills (0) | Photos (0) | Measures (12)

Walls (1) | Windows (8) | Doors (2) | Ceiling (1) | Floor (1)

Roof Type: Bowstring Roof Color: White, Reflective, or Shaded

Height of Roof at Center (in): 10

Existing Insulation: Batt/Blanket (in): 2 Loose Fill (in): 0 Foam Core (in): 0.5

Cathedral Ceiling (%): 0

Additional Cost (\$): \$0.00

Comment:

New Del

Run Audit

Last Run On: 8/26/2014

Flat Roof: Flat roofs have an interior surface (interior ceiling) and an exterior surface (exterior roof) attached directly to either side of the wood framing, similar to wall construction. MHEA assumes the ceiling and roof are separated by 27 x 67 framing.

Bowstring Roof: Bowstring roofs have a lightweight exterior roofing material (usually aluminum) that is stretched over the roof frame structure. The roof has a slight curve with the highest point in the middle of the home width. MHEA uses the width of the home and your input for Height of Roof at the center to calculate the volume of a bowstring roof section.

Pitched Roof: Pitched roofs are sloped to a higher peak point. When viewing the home width from the outdoors, the roof line creates a triangle. Pitched roofs are also often shingled, unlike flat and bowstring roofs. MHEA uses the width of the home and the assumed value for the roof pitch to calculate the volume of a pitched roof section.

1. Input ceiling details on the original manufactured home only, not on the addition (if any).
2. Choose the appropriate Roof Type from the dropdown list. Use F1, if needed, to get a better visual of each different Roof Type.
3. The Roof Color is almost always Normal or Weathered. Choose White, Reflective, shaded only if the roof color is clean enough to function as a white roof (or is mostly shaded).

4. The following entry will change depending on Roof Type but is always asking how much space there is for more insulation.
 - a. Height of Roof at Center (for Bowstring roof): Input height from top of existing insulation to highest point of roof.
 - b. Insulation to Add at Center (for Pitched roof): Input total available height from ceiling to roof ridge.
 - c. Joist Size (for Flat roof): Choose 2x4, 2x6 or 2x8
5. Define the Existing Insulation. Enter the thickness of each type, with a 0 where there is none of any given insulation type.
6. If the home has Cathedral Ceilings, calculate the percentage of total floor area that has cathedral ceilings.
 - a. $((\text{cathedral room length} / \text{total mobile length}) \times 100)$
7. Enter Step Wall Orientation if there is one (rare).

3.29. FLOOR

1. Input Floor details on the original manufactured home only, not on the addition (if any).
2. Floor Joist Direction. Choose whether joists run Widthwise or Lengthwise.
3. Check if there is a mobile home Skirt Present. If it covers only part of the home, the auditor must make a judgment call whether to call it present or not. Consider its ability to prevent wind across the belly.
4. MHEA allows for the possibility that the Floor Wings and the Floor Belly may be different, which is rare in most manufactured homes. You will have to model both.
5. Choose the appropriate Floor Joist Size and input the Loose Insulation Thickness and/or Batt/Blanket Thickness.
 - a. Choose the appropriate Location for the Batt/Blanket insulation.
6. The following 3 inputs ask you to consider the belly material (belly board).
 - a. Belly Cavity Configuration. Rounded is most common. Press F1 for help.
 - b. Condition of Belly (good, average, poor)
 - c. Maximum Depth of Belly Cavity. Measure from the deepest part of the belly, if rounded.

3.30. ADDITION

1. All shell elements of the Addition must be modeled here only, not in the Shell section.
2. All inputs are essentially the same as what you have input previously in the Mobile Home Shell with one exception:
 - a. Wall Configuration. There are three choices here and they all refer to the slope of the ceiling from within the addition.
 - i. Maximum Wall Height at Interior Wall: ceiling is shed type sloping away from mobile home.
 - ii. Maximum Wall Height in Center of Addition: ceiling is Cathedral.
 - iii. All Addition Walls the Same Height: ceiling is flat.

3.31. HEATING (EXISTING)

1. Input for the Primary Heating System first. Use the Secondary input only if there is a secondary unit.
2. Choose the appropriate Equipment Type and Fuel from the dropdown list.
3. Choose the appropriate Capacity (KBTU/hr.) from the dropdown list. Note that, unlike NEAT, this asks for INPUT capacity, not the output.
4. Choose the appropriate Efficiency and Efficiency Units:
 - a. Electric furnace or space heat: 100% AFUE
 - b. Combustion furnace: SSE or AFUE (SSE is better but must be measured)

c. Heat pump: HSPF

- Choose the appropriate Duct Location and Duct Insulation Location.
- Heat Supplied. Input 100% if the primary unit is the only source of heat. Otherwise estimate the % of conditioned floor area heated by each of the primary and secondary units. Must total 100%.
- Choose a Secondary unit on the next tab, if there is one.

3.32. COOLING (EXISTING)

MHEA Audit

Audit Name: Susan Fowler Client ID: Susan Fowler Client Name: Client ID: Alt Client ID:

Audit Information | Status | Shell (13) | Addition (0) | Heating (2) | Cooling (2) | Ducts/Infiltration | Baseloads | Health & Safety | Itemized Costs (2) | Utility Bills (0) | Photos (0) | Measures (12)

Primary (1) | Secondary (0) | Replacement (1)

Equipment Type: Central Air Conditioning Tune-up Mandatory: ☐

Capacity (kBtu/hr): 36

Efficiency: 11.05

Efficiency Units: SEER

Duct Location: Floor

Duct Insulation Location: Below Duct

Floor Area Cooled (%): 100

Comment:

New Del

Run Audit

Last Run On: 8/26/2014 at 4:44 PM

- Inputs are essentially the same as for Heating.
- Capacity. Remember that 1 ton equals 12000 BTU.
- Efficiency Units. Note that, unlike with NEAT, it is possible to input EER without the need to convert the EER to SEER.
- Choose a secondary unit on the next tab, if there is one.

3.33. HEATING AND/OR COOLING (REPLACEMENT)

MHEA Audit

Audit Name: Susan Fowler Client ID: Susan Fowler Client Name: Client ID: Alt Client ID:

Audit Information | Status | Shell (13) | Addition (0) | Heating (2) | Cooling (2) | Ducts/Infiltration | Baseloads | Health & Safety | Itemized Costs (2) | Utility Bills (0) | Photos (0) | Measures (12)

Primary (1) | Secondary (0) | Replacement (1)

Equipment Type: Furnace

Fuel: Natural Gas

Capacity (kBtu/hr): 85

Efficiency: 85

Efficiency Units: AFUE

Duct Location: Floor

Duct Insulation Location: Below Duct or Uncovered

Replacement Required: ☒

Include in EIR: ☒

Cost: Labor (\$): 000 Material (\$): 000

Comment: N/A

New Del

Run Audit

Last Run On: 8/26/2014 at 4:44 PM

- Choose a Replacement Heating and/or Cooling System. Note that if the Replacement details are not filled out, MHEA is not able to consider whether a replacement is needed because it has nothing to compare with the existing unit.
- Inputs are the same as for the existing Heating and/or Cooling Systems.
- Efficiency units. Remember that a new combustion unit that has not been installed CANNOT have a Steady State. Choose AFUE.

4. HEAT PUMP REPLACEMENT AS ECM. MHEA, unlike NEAT, does not recognize that a heat pump serves both heating AND cooling functions. Therefore, if a new heat pump is sought, the total cost for that heat pump can be divided between the Heating Replacement and the Cooling Replacement. Those costs can be divided ANY way that works, so long as both the Heating and Cooling Replacements provide an SIR of 1.0 or greater.

For example: A total install cost of \$5000 can be divided as:

Heating	Cooling
\$2500	\$2500
\$1000	\$4000
\$4990	\$10

5. Any combination of costs is OK, so long as the combined cost equals the total install cost.

3.34. NEAT AND MHEA COMBINED

3.35. DUCTS / INFILTRATION

1. Check the box Evaluate Duct sealing to get additional funds for duct sealing. Extra on-site measurements will be required. (See next page).
 - a. Evaluate Duct Sealing MUST be checked if pressure pan results show 3 or more ducts with pressures greater than 2.0 Pa or any single pressure pan greater than 5.0.
2. Before Weatherization. Enter the blower door result achieved at pre-audit.
3. After Weatherization. Enter the target blower door result. Target must be calculated using the ODOC Target spreadsheet.
4. Target must be met for the measure to pass at QA and/or final. If you don't believe the target as calculated above is achievable, you can write in your own target. You MUST explain your reasoning for this in Comments.
5. If target is not achieved at Final or QCI due to changes to the pressure boundary of the home that occurred after weatherization was completed, these changes must be clearly documented to determine if the measure should pass.
6. Costs - Infiltration Reduction. Enter here the amount of money you wish to receive for ALL air sealing measures on this home. Leaving it blank will eliminate the air sealing measure.
7. You may choose to type in Comments some or all of the specific air sealing needs noted by the auditor. This is helpful but not required.

3.36. EVALUATE DUCT SEALING – DUCT BLOWER MEASUREMENTS

Choose this option for all Site Built homes

As measured in the field with Duct Blaster

Input 25 Pa for all 6 boxes

1. Duct Operating Pressures:
 - a. Before Duct Sealing. Both Supply and Return static pressures need to be measured in the field. Typically, one is measured and then the other. Testing does not have to be simultaneous. Static duct pressures are measured with the furnace air blower on. The blower door must NOT be running.
 - b. Supply static pressure: It is best to insert the manometer hose in the supply plenum. If this is not possible, or not practical, insert the hose in the nearest supply register and snake the hose as close as you can to the plenum. You can close the register through which you are testing, or tape it shut, to get a better reading.
 - c. Return static pressure: It is best to insert the manometer hose in the return plenum. If this is not possible, or not practical, insert the hose in the nearest return register and snake the hose as close as you can to the plenum.
2. After Duct Sealing: In most cases, add 5 Pa to the Before Duct Sealing result.
3. Before Duct Sealing (Existing): Input the data as measured in the field.
4. After Duct Sealing (Target or Actual):
 - a. Total Leakage: 12% of total conditioned floor area of home
 - b. Leakage to Outside: 8% of total conditioned floor area of home
5. Use the ODOC Target Spreadsheet to calculate targets.
6. Duct sealing target must be met for the measure to pass at final inspection and/or QCI. Result can be lower than target but, if higher, must be within 10% of target.
7. If target is not achieved at Final or QCI due to changes to the pressure boundary of the home that occurred after weatherization was completed, these changes must be clearly documented to determine if the measure should pass.
8. If you don't believe the target as calculated above is achievable, you can write in your own target. You MUST explain your reasoning for this in Comments.
9. Duct Sealing Cost. Input amount needed for duct sealing. SIR must be 1.0 or greater.

10. NEAT will not accept \$0 for duct sealing. If you cannot achieve a duct sealing measure with an SIR ≥ 1.0 , then uncheck Evaluate Duct Sealing. See below for more information.
11. Evaluate Duct Sealing – Pressure Pan Measurements (MHEA only)
 - a. Use this option for all MHEA audits with ducted systems.
 - b. Input the sum of all pressure pan readings in the home. The target is usually the number of registers in the home (1 Pa per register).
 - c. You can increase this if needed to ensure you have an achievable target.
12. Note that no register should have a pressure pan greater than 3.0 Pa when work is completed, and not more than 3 registers should have pressure pans greater than 1.0.
13. Target must be met for the measure to pass at QA and/or final.
14. If you enter the data correctly, but cannot get the measure with an SIR ≥ 1.0 :
 - a. Consider your target. Can you input a target tighter than what you calculated that is still achievable? (Remember, you must achieve target for the measure to pass at QA). If so, change the target and run the audit again. If not, move on to step 2.
 - b. If you still cannot get an SIR ≥ 1.0 , then your only option is to turn off the Evaluate Duct Sealing:

NEAT Audit

Audit Name: **Audit (1)** Client ID: Sample Client Client Name: Alt. Client ID:

Audit Information | Status | Shell | Heating (0) | Cooling (0) | Ducts/Infiltration | Baseloads | Health & Safety | Itemized Costs (0) | Utility Bills (0) | Photos (0) | Measures (0)

Air and Duct Leakage | Optional Blower Door and Zonal Pressures (0) | Optional Pressure Balance (0) | Optional Pressure Pans (0)

Evaluate Duct Sealing ☒ Duct Leakage Method:

Whole House Blower Door Measurements

	Before Weatherization (Existing)	After Weatherization (Target or Actual)
Air Leakage Rate (cfm)	<input type="text"/>	<input type="text"/>
at House Pressure Difference (Pa)	<input type="text"/>	<input type="text"/>

Costs

Infiltration Reduction (\$) Comment:

Uncheck this box if duct sealing SIR is below 1.0

Refresh Tightness Limit Enter information on the Audit Information tab see the minimum recommended CFM

Run Audit Last Run On Not Run at

- c. Explain in Comments that you attempted duct sealing but could not get the measure with an SIR above 1.0.
 - d. Your comment will remain even after you uncheck Evaluate Duct Sealing, as will the data you entered to attempt duct sealing.
15. Note that it is allowable to use Infiltration funds to seal ducts. However, it is not allowable to use duct sealing money for other air sealing measures.

3.37. BASELOADS – WATER HEATERS

Choose a replacement only if an existing water heater has been chosen from the internal database.

1. NEAT holds a large database of water heater data. If you can locate your client's water heater in the database, choose that. If not, you can manually type in the Manufacturer and Model without pulling data from the database.
 - a. Do NOT choose a model that is different from the one in the client's home.
2. Choose the appropriate Fuel and Location from the dropdown lists.
3. Enter the Rated Input and define the Input Units, if you desire. This is not required. Remember, a typical electric tank is 4.5 KW, not 45 or 0.45
4. Enter the Size of the storage tank. Typically: 30, 40 or 50 gallons.
5. Check if Water Heater Wrap Present. NEAT will not provide water heater wrap if this is checked.
6. Check if Water Heater Pipe Insulation Present. NEAT will not provide water heater pipe insulation if this is checked.
7. Original Tank Insulation. Enter EITHER the R-value OR the Thickness and Type of the internal tank insulation. This is rarely marked on the tag. You can:
 - a. Measure existing insulation by removing an access cover and measuring thickness & type. OR:
 - b. Input an existing R5. This is fairly accurate for most water heaters.
8. Shower Heads. Enter the Number of Showerheads in the home; the total Shower Use per day; and the Avg. GPM (gallons per minute).
 - a. Typically, you can count 10-15 minutes per resident.
9. GPM must be measured or taken from the manufacturer's data imprinted on the showerhead.
 - a. If measuring: Time how many seconds it takes to fill a 4-cup measuring cup.
 - b. $GPM = 15 / \text{result (in seconds)}$

3.38. REFRIGERATORS

The screenshot shows the NEAT software interface for refrigerator data entry. The 'Replacement' section is circled in red, indicating the 'Pick from Library' dropdown menu. The 'Existing Equipment' section includes fields for Manufacturer, Model, Style, Size, and Location. The 'Consumption' section has fields for Label/Database Annual Consumption, kWh/yr, Age, Door Seal Condition, and Metered Consumption. The 'Replacement' section includes fields for Manufacturer, Model, Style, Defrost, kWh/yr, Size, Height, Width, Depth, Installation Cost, Additional Cost, Adjusted Consumption, and Annual Savings.

Choose a replacement
only if fridge has been
metered.

This data comes from
the Supply Library.

- Existing Equipment: NEAT holds a large database of refrigerator data. If you can locate your client's refrigerator in the database, you can do so. Note that many of the Model numbers use asterisks to indicate any variety of number or letter.
- Do not choose any fridge other than the one in the client's home.
- If the model is not found, you can leave the information blank or fill it out manually.
- Consumption – Label/Database Annual Consumption. If you did not find the fridge in the database, then you will need to fill out these fields (ignore if you are metering the fridge):
 - KWh/yr.: Go online to find estimate of fridge usage.
 - Age: Find on manufacturer's tag or hidden in serial number.
 - Door Seal Condition: If you choose POOR be sure to take photos.
- If you Metered the fridge, enter the following data (Label Consumption and door seal condition will be ignored):
 - Metering Minutes: Enter the number of minutes you metered the fridge (must be 120 minutes or greater).
 - Enter the Meter Reading in KWh. This is rarely higher than 0.4 KWh
 - If you noticed a spike during metering that may indicate the fridge entered a Defrost Cycle during metering. Check the box Includes Defrost Cycle. Used rarely.
- Replacement refrigerators shall be sized by family size:
 - 1-4 persons - 18 ft.
 - 5-9 persons - 21 ft.

3.39. LIGHTING SYSTEMS

Water Heating (1) | Refrigerators (1) | Lighting Systems (1)

Existing Incandescent Light

Light Code

Room

Location

Lamp Type

Quantity

Size (watts)

Use (hours/day)

Replacement Compact Fluorescent Light (CFL)

CFL Size (watts)

Additional Cost (\$/bulb)

LIGHTING SYSTEM

by Light Code

1 of 1 New Copy Del

Comment

1. A Light Code must be input.
2. Only input existing incandescent lights that are used 2 hours/ day or more.
3. Input the Room and Location of the lights. It is recommended inputting, as a single record, every light in the home that is the same wattage and is used for approximately the same amount of time.
4. Choose the appropriate Lamp Type (usually: Standard).
5. Input Quantity and Size (Watts) of this type of light, and the average hours used per day.
 - a. The replacement wattage of an equivalent CFL will automatically be projected. This can be changed if you are using LEDs but NEAT will still refer to them as CFL.
6. CFL bulbs are no longer an allowable material. Use LEDs only.
7. Note: NEAT only considers the following wattages: 5, 7, 9, 13, 18 (and higher)
8. Use this table to help you choose the appropriate LED equivalent wattage:

Incandescent	CFL	LED
100W	26W	18W
75W	18W	9 or 13W
60W	13W	7W
40W	7W	5W

3.40. HEALTH AND SAFETY

The screenshot shows the NEAT Audit software window. At the top, there are fields for 'Audit Name' (Ann Whitehead), 'Client ID' (Ann Whitehead), 'Client Name', and 'Alt. Client ID'. Below these are several tabs: 'Audit Information', 'Status', 'Shell', 'Heating (2)', 'Cooling (2)', 'Ducts/Infiltration', 'Baseloads', 'Health & Safety' (which is selected), 'Itemized Costs (2)', 'Utility Bills (0)', 'Photos (0)', and 'Measures (13)'. Under the 'Health & Safety' tab, there are sub-tabs: 'Whole House', 'Equipment', and 'Building Shell'. The 'Whole House' sub-tab is active, showing a 'Smoke Detector is Needed' checkbox (unchecked), a 'CO Monitor is Needed' checkbox (unchecked), and a 'Carbon Monoxide Measurements' section with four input fields: 'Room with Heating System (ppm)', 'Room with Water Heater (ppm)', 'Living Area (ppm)', and 'Kitchen (ppm)'. Below these is a 'Comment' text area. On the right side of the window, there is a 'Run Audit' button and a 'Last Run On' timestamp showing '8/28/2014 at 3:08 PM'.

1. This tab can be skipped over entirely.
2. Any Health & Safety items can be input directly under Itemized Costs and will be defined as H&S simply by NOT checking the Include in SIR box.
3. If you want to complete data in the three sub-tabs of Health & Safety, know that NEAT will NOT automatically provide any measure based on these inputs.
4. The only exception to this is if function #11 under Preferences / Features is checked. This will allow NEAT to automatically add checked H&S items to Itemized Costs. However, quantities and prices MUST be adjusted on a case by case basis.

3.41. ITEMIZED COSTS

NEAT Audit

Audit Name: ann Whitehead Client ID: Ann Whitehead Client Name: Alt. Client ID:

Audit Information | Status | Shell | Heating (2) | Cooling (2) | Ducts/Infiltration | Baseloads | Health & Safety | Itemized Costs (2) | Utility Bills (0) | Photos (0) | Measures (13)

Copy from User Defined Measures
Copy from Library Health and Safety Measures

Referenced User Defined Measure
Clear Reference to User Defined Measure

Run Audit
Last Run On: 8/26/2014 at 3:08 PM

Measure Name: new flue
Cost (\$): \$30.00
Material: Include in SIR ☒

Check the box for IRMs
Leave box unchecked for H&S

Using these dropdowns does not tend to be a time saver.
If you do, make sure to Clear Reference (above)

ITEMIZED COST
by Description
1 2 New Copy Del

Comment

1. The easiest and fastest way to input data here is simply to type it yourself.
2. Input an appropriate Measure Name, which will be understandable by both yourself and others. Include the number of units of that item (such as 5x smoke detector).
3. Input a Cost for this measure.
4. Include in SIR. This is truly asking: Is this measure to be included in the calculation to determine the Cumulative SIR?
 - a. Incidental Repairs will have the "Include in SIR" box checked because the zero SIR of an Incidental Repair is meant to bring down the Cumulative Whole House SIR of this job and thus limit the amount that can be spent as IRMs. (Incidental Repairs will show up on the Report with an SIR = 0)
 - b. IRMs must state in Comments to which ECM they are linked.
 - c. GHWR measures are input as IRMs, with "Include in SIR" checked, but are not linked to an ECM. State in the Comments that it is a GHWR measure. See [Section 2.14](#) for more information.
 - d. With Health & Safety measures, "Include in SIR" is **NOT** checked, because they do not affect the Cumulative Whole House SIR.
5. Press NEW in the lower left of the page to create a new blank record for additional Itemized Costs.
6. See next page for further instruction, guidance, and examples.

Incidental Repair

SIR = 0 and at the top

IRMs reduce the
Cumulative SIR of a job.

H&S measures do not.

Energy Saving Measure Economics

Index	Recommended Measure	Components	Measure Savings (\$/yr)	Measure Cost (\$)	Measure SIR	Cumulative Cost (\$)	Cumulative SIR
1	ROOF REPAIR		0	300	0.0	300	0.0
2	vapor barrier		0	421	0.0	721	0.0
3	Seal Ducts		33	300	1.0	1021	0.3
4	Infiltration Redctn		81	700	1.1	1721	0.8
5	Lighting Retrofits	LT1,LT2,LT3	48	16	33.7	1737	0.9
6	DWH Pipe Insulation		8	8	11.9	1745	1.0
7	DWH Tank Insulation		9	33	3.3	1778	1.0
8	Storm Windows	WD7	11	67	2.2	1845	1.1
9	Attic Ins. R-30	A1	80	727	2.1	2572	1.3
10	Door Replacement	Dr2	35	319	1.9	2891	1.4
11	ASHRAE bath fan - 29 CFM continuous		0	800	0.0	3691	0.0
12	Fix water heater venting		0	35	0.0	3726	0.0
13	Install 2 C.O		0	180	0.0	3905	0.0
14	Install Smoke Detector		0	29	0.0	3934	0.0

H & S

SIR = 0 and at bottom

INCIDENTAL REPAIR

Include in SIR



WEATHERIZATION
(ENERGY SAVING)
MEASURES

HEALTH & SAFETY

Include in SIR



3.42. RECOMMENDED MEASURES

1. After the Run Audit button is pressed, this report will be generated.
2. The most important information will be in the section called Energy Saving Measure Economics.



NEAT Recommended Measures

Agency State Run On RunID
 Client ID Version AuditID
 Audit Name Audit Date
 Client Name Auditor
 Weather File Setup Library Name
 Comment

Annual Energy and Cost Savings

Index	Recommended Measure	Components	Heating (MMBtu)	Heating (\$)	Cooling (kWh)	Cooling (\$)	BaseLoad (kWh)	BaseLoad (\$)	Total (MMBtu)
1	Seal Ducts		3.6	33	0	0	0	0	3.6
2	Infiltration Redctn		6.9	64	159	17	0	0	7.5
3	Lighting Retrofits	LT1,LT2,LT3	0.0	0	0	0	446	48	1.5
4	DWH Pipe Insulation		0.0	0	0	0	242	8	0.8
5	DWH Tank Insulation		0.0	0	0	0	294	9	1.0
6	Storm Windows	WD7	1.0	9	19	2	0	0	1.0
7	Attic Ins. R-30	A1	5.2	48	297	32	0	0	6.2
8	Door Replacement	Dr2	3.4	31	39	4	0	0	3.5

Energy Saving Measure Economics

Index	Recommended Measure	Components	Measure Savings (\$/yr)	Measure Cost (\$)	Measure SIR	Cumulative Cost (\$)	Cumulative SIR
1	ROOF REPAIR		0	300	0.0	300	0.0
2	vapor barrier		0	421	0.0	721	0.0
3	Seal Ducts		33	300	1.0	1021	0.3
4	Infiltration Redctn		81	700	1.1	1721	0.6
5	Lighting Retrofits	LT1,LT2,LT3	48	16	33.7	1737	0.9
6	DWH Pipe Insulation		8	8	11.9	1745	1.0
7	DWH Tank Insulation		9	33	3.3	1778	1.0
8	Storm Windows	WD7	11	67	2.2	1845	1.1
9	Attic Ins. R-30	A1	80	727	2.1	2572	1.3
10	Door Replacement	Dr2	35	319	1.9	2891	1.4
11	ASHRAE bath fan - 29 CFM continuous		0	800	0.0	3691	0.0
12	Fix water heater venting		0	35	0.0	3726	0.0
13	Install 2 C.O		0	180	0.0	3906	0.0
14	Install Smoke Detector		0	29	0.0	3934	0.0

Audit Name: test

Client: Maria Gonzales DOE 19 OKL Date: 11/13/2019

Page 1 of 4

3.43. ENERGY SAVING MEASURE ECONOMICS

Energy Saving Measure Economics

Index	Recommended Measure	Components	Measure Savings (\$/yr)	Measure Cost (\$)	Measure SIR	Cumulative Cost (\$)	Cumulative SIR
1	ROOF REPAIR		0	300	0.0	300	0.0
2	vapor barrier		0	421	0.0	721	0.0
3	Seal Ducts		33	300	1.0	1021	0.3
4	Infiltration Redctn		81	700	1.1	1721	0.6
5	Lighting Retrofits	LT1,LT2,LT3	48	16	33.7	1737	0.9
6	DWH Pipe Insulation		8	8	11.9	1745	1.0
7	DWH Tank Insulation		9	33	3.3	1778	1.0
8	Storm Windows	WD7	11	67	2.2	1845	1.1
9	Attic Ins. R-30	A1	80	727	2.1	2572	1.3
10	Door Replacement	Dr2	35	319	1.9	2891	1.4
11	ASHRAE bath fan - 29 CFM continuous		0	800	0.0	3691	0.0
12	Fix water heater venting		0	35	0.0	3726	0.0
13	Install 2 C.O		0	180	0.0	3905	0.0
14	Install Smoke Detector		0	29	0.0	3934	0.0

Incidental Repairs
SIR = 0

Cumulative SIR
Must be 1.0 or greater

All ECMs (after air sealing) are listed in decreasing order of SIR.

Measures cut due to budget **MUST** be cut from the lowest upwards.

Health & Safety
SIR = 0

- No weatherization measure is allowed that has a Measure SIR of less than 1.0, with one exception;
 - So long as no Mandatory Replacements are attempted, an SIR below 1.0 is only possible for Infiltration Reduction.
- Incidental Repairs (if any) will always show up at the top of the list and have an SIR = 0.0
- Health and Safety items will always show up at the bottom of the list. Most H&S items will have an SIR = 0.0, except for weatherization measures that are replaced as a mandatory H&S item.
- Such measures may have a measure SIR higher than 0.0 but their SIR in the Cumulative SIR column will always be 0.0.
- Once approved, all Energy Conservation Measures (ECMs) from the audit must be installed in the unit, as funding allows.
- If required by budget limitations, cut measures (ECMs and related IRMs, but **NOT** necessary H&S measures) from the lowest SIR measure and continue upwards until cost is within budget. See [Appendix E](#) for more information about Measure Skipping.
 - Major measures must not be skipped.

3.44. TYPICAL RANGES FOR SIRS

This list is meant as a guide to help auditors and QCI gauge the accuracy of an audit. It is based on an examination of 25 random NEAT audits run with different Setup Libraries and from different states. An SIR higher than the Highest Expected is not necessarily wrong but should be examined more carefully to confirm accuracy.

Measure Name	Average SIR	Highest Expected SIR (rounded up)
Air Sealing	2.0	3
Attic Insulation	3.4	8
Floor insulation	2.7	5
Wall insulation	3.4	9
Knee wall insulation	8.1	14
Duct insulation	9.9	17
Low E Windows	1.6	3
Storm windows	1.2	2
DHW Tank Wrap	4.7	8
DHW Pipe Wrap	12.6	21
Low-flow Showerhead	68.6	209
Refrigerator	1.8	3
CFL or LED lights	11.5	22

3.45. MATERIALS AND ENERGY & LOADS

Materials

<i>Index</i>	<i>Material</i>	<i>Quantity</i>	<i>Units</i>
1	Wall Insulation Blown Cellulose - 2x4 Filled	836	SqFt
2	Compact FL 13 Watt	10	Each Lamp
3	DHW Pipe Insulation	1	Each
4	Attic Insulation Blown Fiberglass - R-38	800	SqFt
5	CO monitor (+)	1	Each
6	Bathroom exhaust fan (+)	1	Each
7	Kitchen exhaust fan (+)	1	Each
8	Pressure relief piping (+)	1	Each
9	Smoke detector (+)	1	Each
10	Smoke detector (+)	1	Each

This is the NET wall area to be insulated.
Gross area of all walls minus area of windows and doors.
You won't find this number anywhere else.

Material section can help by
providing a summary of all material
being called for by the audit.

Pre/Post Retrofit Energy and Loads

	<i>Pre Retrofit</i>		<i>Post Retrofit</i>	
	<i>Heating</i>	<i>Cooling</i>	<i>Heating</i>	<i>Cooling</i>
Annual load (MBtu/yr)	32.1	36.6	9.7	21.3
Annual Energy (MBtu/yr)	33.8	12.3	10.2	7.2
Heat loss/gain (kBtu/hr)	50.5	26.3	16.5	9.6
Output required (kBtu/hr)(ton)	50.5	2.5	16.5	1.0

BEFORE WX

AFTER WX

This is a fairly accurate **Manual J** of the home before and after Weatherization.
This can be used by the auditor as a quick verification of the Manual J
submitted by the HVAC contractor.

However, ODOC rules state that an ACCA-certified Manual J must be run.
The Manual J must be run based on post-weatherization data (i.e., new
insulation levels, etc.) See ODOC **WPN 19.3**

3.46. WORK ORDERS

1. To create a Work Order:

(1) Go to MEASURES Tab

(2) Press Create Work Order

#	Measure Name	Components	VO	Contractor	Cost Center	<Est. Cost>	Est SFR	
1	Vapor barrier 1421 sq ft		<input checked="" type="checkbox"/>			\$1,000.00	0.0	Costs
2	Infiltration Redctn		<input checked="" type="checkbox"/>			\$1,300.00	1.0	Costs
3	Low Flow Showerheads		<input checked="" type="checkbox"/>			\$37.70	21.9	Costs
4	DWH Pipe Insulation		<input checked="" type="checkbox"/>			\$16.25	12.4	Costs
5	Duct Insulation		<input checked="" type="checkbox"/>			\$78.96	6.0	Costs
6	DWH Tank Insulation		<input checked="" type="checkbox"/>			\$100.00	4.4	Costs
7	Floor Ins. R-19	F2	<input checked="" type="checkbox"/>			\$461.28	3.2	Costs
8	Floor Ins. R-19	F1	<input checked="" type="checkbox"/>			\$1,556.26	2.2	Costs
9	Attic Ins. R-30	A1	<input checked="" type="checkbox"/>			\$1,668.72	1.9	Costs
10	Refrigerator Pplcmnt		<input checked="" type="checkbox"/>			\$700.00	1.8	Costs
11	Wall Insulation	WL (1) WL (2) WL (3)	<input checked="" type="checkbox"/>			\$2,601.11	1.7	Costs
12	ASHRAE fan for bathroom 41 CFM		<input checked="" type="checkbox"/>			\$500.00	0.0	Costs
13	CO detector x 1		<input checked="" type="checkbox"/>			\$60.00	0.0	Costs
14	Smoke detector x 4		<input checked="" type="checkbox"/>			\$160.00	0.0	Costs
15	T&P downspout		<input checked="" type="checkbox"/>			\$50.00	0.0	Costs

If a measure is being removed due to budget limitations, uncheck the relevant measure(s) here. Do NOT remove the measure from the audit.

2. Work Order Information

(3) Go to MEASURES Tab

Print or Preview Work Order here

Work Order WO/Jonathan Geissler/2

Client ID Jonathan Geissler

Work Order Information | Status | Measures (16) | Photos (0)

Work Order: WO/Jonathan Geissler/2

Client ID: Jonathan Geissler

Agency: NRCERT State: US

<Audit Name> 9 Lynnwood audit

<Supply Library> WX Wx Supply Library 2013

Contractor/Crew:

Work Order Type: Weatherization

Work Order Economic Summary

Number of Active Measures: 16

Cumulative Estimated Cost: \$10,390.28

Cumulative Actual Cost:

WORK ORDER

by Work Order Name: by Client ID:

by Alternate Client ID: by Contractor:

by Client Name:

12 of 16 New Copy Del

REPORT

Select Report: Work Order

Preview Print Snapshot File

4. Work Order Measures – Entering Actual Prices

Work Order

WO **WO/Jonathan Geissler/2** Client ID Jonat

Work Order Information Status Measures (16) Photos (0)

Order # 7 Active ☒

MeasureType Building Insulation

Measure Name Floor Ins. R-19

Components F2

Cost Center

Actual/Estimated Adjustment Factor (%) 100.00%

Comment

Materials/Labor Details

#	Type^	Copy Supply^	Description	Units+	Est Qty	Est \$/Unit	Est Total	Est-To-Act	Act Qty
1	Insulation		Floor Insulation - Fiberglass Batts - R-19	SqFt	388	\$0.73	\$283.24		
2	Labor		Floor Insulation - Fiberglass Batts - R-19	SqFt	388	\$0.33	\$128.04		
3	Miscellaneous		Floor Insulation - Fiberglass Batts - R-19	Each	1	\$50.00	\$50.00		
*									

MEASURES

by Measure Name

7 of 16

New Copy Del

Show Audit Material Detail

Create Materials Using Audit Detail

Show Audit Economic Details

Estimate Actual

Cost \$461.28

SIR 3.2

Type in Comments or import
Comments from the audit.
See next page.

Estimated price
and SIR from NEAT
or MHEA

Navigate here. We are looking at
Measure #7 of 16 total measures.

5. Scroll over to the right...Now you can input the actual or bid price from your contractor (In this example, the bid price is \$1000). Note: there is no need to separate labor and material costs.

Materials/Labor Details

Actual/Estimated Adjustment Factor (%) 100.00%

#	Type^	Copy Supply^	Description	Est Total	Est-To-Act	Act Qty	Act \$/Unit	Act Total
1	Insulation		Floor Insulation - Fiberglass Batts - R-19	\$283.24	<Copy>	1	\$1,000.00	\$1,000
2	Labor		Floor Insulation - Fiberglass Batts - R-19	\$128.04	<Copy>			
3	Miscellaneous		Floor Insulation - Fiberglass Batts - R-19	\$50.00	<Copy>			
*					<Copy>			

Record: 1 of 3

MEASURES

by Measure Name

7 of 16

New Copy Del

Show Audit Material Detail

Create Materials Using Audit Detail

Show Audit Economic Details

Estimate Actual

Cost \$461.28 \$1,000.00

SIR 3.2 1.5

Actual price and SIR

6. Adding Comments to the Work Order

Work Order Information | Status | Measures (16) | Photos (0)

Order # 7 Active ☒

MeasureType Building Insulation

Measure Name Floor Ins. R-19

Components F2

Cost Center

Materials/Labor Details

Actual/Estimated Adjustment Factor (%) 100.00%

(1) Press **Comment**

To reveal this...

Comment Editor

EER11.3
LIHEAP-funded unit to be installed. Existing gas-pack heat could not be turned on; cooling broken.

(2) Click the dropdown to reveal all Comments made in the audit. Choose the relevant comment to copy it to the work order.

Use an Audit Comment

Source	Comment
02-Shell-Wall	\$100 additional cost for inside blow ...
02-Shell-Wall	\$100 additional cost for inside blow ...
02-Shell-Wall	\$100 additional cost for inside blow ...
02-Shell-Wall	\$100 additional cost for inside blow ...
05-Shell-Unfinished Attic	\$250 additional cost for attic dams around floored ...
07-Shell-Foundation	Insulated portion of basement floor 16x12 ...
07-Shell-Foundation	Basement area is 29x29 but 9x29 is below unconditi...
09-Heating	LIHEAP-funded unit to be installed. Existing gas-p...
15-Cooling	LIHEAP-funded unit to be installed. Existing gas-p...
15-Cooling	EER 11.3 ...
15-Cooling	EER 11.3 ...
16-Ducts-Air	Air sealing must include insulated box around whol ...
31-Itemized	Clothes dryers will be ducted to the outdoors. whi ...
31-Itemized	The discharge piping serving a pressure-relief val ...
31-Itemized	ASHRAE fan for bathroom 43 CFM continuous. Must be ...

- When you're done go back to the Work Order Information page. Print on paper or print as PDF.
- If you need to go back and find an existing work order, go here

Weatherization Assistance Program

Energy Audits

Site Built (NEAT)

Mobile Home (MH-EA)

Work Orders

<Database> C:\Users\khatnason\Desktop\NEAT\Databases for class\NEAT MH-EA

Description: Default Backed Database File

Setup Library | Supply Library | Preferences | Help | ExitWA

4. LOCAL QUALITY CONTROL INSPECTION OF THE ENERGY AUDIT

4.1. BLOWER DOOR AND DUCT SEALING TARGETS

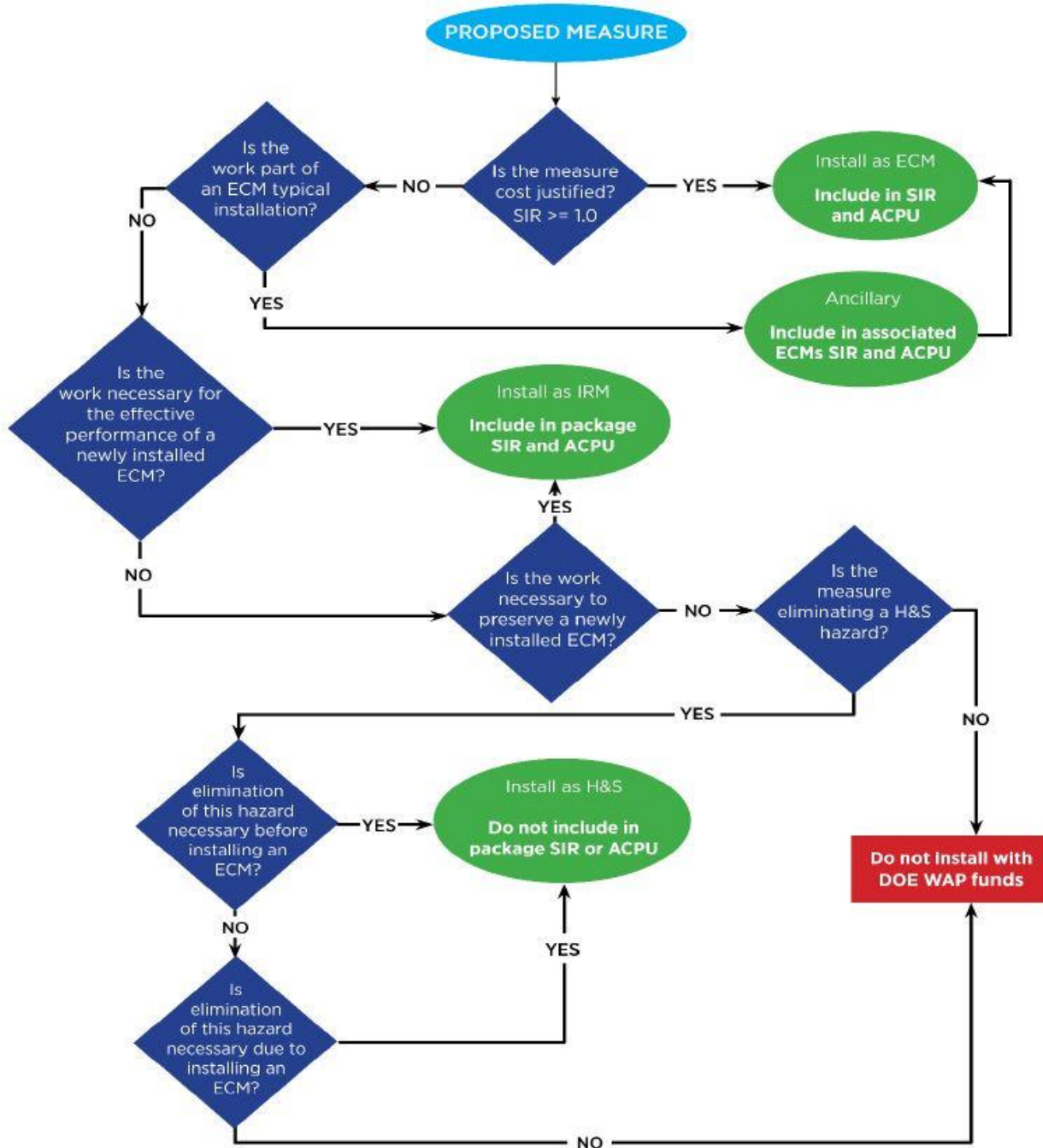
1. QCI shall assess the accuracy of the blower door and duct sealing target calculations
2. Deviation from the calculation for blower door and duct sealing targets is allowed but must be justified by the auditor in the NEAT or MHEA audit.
3. Air sealing and duct sealing targets calculation must be determined using the ODOC Target Spreadsheet
4. QCI shall perform appropriate testing in the home to confirm the final results from infiltration and duct sealing.
5. Results achieved at QCI may be lower than target but must be not more than 10% of target value higher than target.
6. If results achieved at QCI are greater than 10% higher than the target value, the air sealing and /or duct sealing measure(s) will not pass.

4.2. OTHER QCI PROCEDURES

1. The QCI must complete Form 44 and Form 45
2. A desk review of the job should occur before an in-field visit of the home being assessed. The desk review shall include:
 - a. Confirmation of the accuracy of the NEAT MHEA inputs.
 - b. Confirmation that work completed followed the NEAT MHEA work order.
 - c. Confirmation that invoiced items did not exceed the amounts allowed for in the NEAT MHEA work order.
3. It is the QCI's responsibility to ensure that all measures performed "will result in work that achieves the desired outcomes in the SWS."¹⁵
4. The QCI must repeat all diagnostic tests performed on the home by the auditor at pre- and/or post-inspection in order to verify those results.

¹⁵ DOE WPN 15-4

Appendix A
WPN 19-5 Definition Flow Chart



ACRONYMS

ACPU: Average Cost Per Unit
ECM: Energy Conservation Measure
H&S: Health & Safety

IRM: Incidental Repair Measures
SIR: Savings to Investment Ratio

APPENDIX B

When the manufacture's tag is missing or illegible:

- Age can only be estimated
 - Ask client – unit was often purchased on a memorable year
- Capacity can only be estimated
- For Efficiency, use the following guide (summarized from Equipment Efficiencies sheet, Appendix C):

Unit Type	< 1970	~ 1980	~ 1990	~ 2000
Central AC or Heat Pump (SEER)	6.0	7.7	9.5	11.0
Heat Pump (HSPF)	5.0	5.8	6.5	7.2
Window AC (EER)	6.0	7.0	8.3	9.3

APPENDIX C

Heating and Cooling Efficiencies Based on Manufactured Date *March 20, 2015*

Manufactured Date	Cooling Efficiency				Heat Pump Heating Efficiency (HSPF)
	Central Air Conditioner or Heat Pump (SEER)	Room or Window Air Conditioner			
		(EER)	(SEER) ¹	(SEER) ²	
<1970	6.0	6.0	5.5	6.5	5.0
1970	6.0	6.0	5.5	6.5	5.0
1971	6.1	6.0	5.5	6.5	5.2
1972	6.3	6.0	5.5	6.5	5.2
1973	6.5	6.1	5.6	6.7	5.3
1974	6.6	6.3	5.7	6.8	5.4
1975	6.8	6.4	5.9	7.0	5.4
1976	7.0	6.5	6.0	7.1	5.5
1977	7.2	6.7	6.1	7.3	5.6
1978	7.4	6.8	6.2	7.4	5.6
1979	7.5	6.9	6.3	7.6	5.7
1980	7.7	7.0	6.4	7.8	5.8
1981	7.9	7.2	6.6	7.9	5.8
1982	8.1	7.3	6.7	8.1	5.9
1983	8.2	7.4	6.8	8.2	6.0
1984	8.4	7.6	6.9	8.4	6.1
1985	8.6	7.7	7.0	8.5	6.1
1986	8.8	7.8	7.1	8.7	6.2
1987	9.0	8.0	7.3	8.8	6.3
1988	9.1	8.1	7.4	9.0	6.3
1989	9.3	8.2	7.5	9.2	6.4
1990	9.5	8.3	7.6	9.3	6.5
1991	9.7	8.5	7.7	9.5	6.5
1992	9.9	8.6	7.8	9.6	6.6
1993	10.0	8.7	8.0	9.8	6.7
1994	10.2	8.9	8.1	9.9	6.7
1995	10.4	9.0	8.2	10.1	6.8
1996	10.6	9.0	8.2	10.1	6.9
1997	10.7	9.0	8.2	10.1	6.9
1998	10.8	9.0	8.2	10.1	7.0
1999	10.9	9.0	8.2	10.1	7.1
2000	11.0	9.25	8.4	10.4	7.2
2001	11.1	9.5	8.7	12.1	7.2
2002	11.1	9.75	8.9	11.0	7.3
2003	11.2	9.75	8.9	11.0	7.3
2004	11.6	9.75	8.9	11.0	7.4
2005	11.9	9.75	8.9	11.0	7.5
2006	12.3	9.75	8.9	11.0	7.6
2007	12.7	9.75	8.9	11.0	7.6
2008	13.0	9.75	8.9	11.0	7.7
>2008	13.0	9.75	8.9	11.0	7.7

¹Fan runs continuously (assumed in Version 8.3)

²Fan runs only when cooling

APPENDIX D

AGE (years)	DERATING EFFICIENCY BY AGE								
	ORIGINAL EFFICIENCY (SEER, EER or HSPF)								
	5	6	7	8	9	10	11	12	13
1	5.0	5.9	6.9	7.9	8.9	9.9	10.9	11.9	12.9
2	4.9	5.9	6.9	7.8	8.8	9.8	10.8	11.8	12.7
3	4.9	5.8	6.8	7.8	8.7	9.7	10.7	11.6	12.6
4	4.8	5.8	6.7	7.7	8.6	9.6	10.6	11.5	12.5
5	4.8	5.7	6.7	7.6	8.6	9.5	10.5	11.4	12.4
6	4.7	5.6	6.6	7.5	8.5	9.4	10.4	11.3	12.2
7	4.7	5.6	6.5	7.5	8.4	9.3	10.3	11.2	12.1
8	4.6	5.5	6.5	7.4	8.3	9.2	10.2	11.1	12.0
9	4.6	5.5	6.4	7.3	8.2	9.1	10.0	11.0	11.9
10	4.5	5.4	6.3	7.2	8.1	9.0	9.9	10.9	11.8
11	4.5	5.4	6.3	7.2	8.1	9.0	9.8	10.7	11.6
12	4.4	5.3	6.2	7.1	8.0	8.9	9.8	10.6	11.5
13	4.4	5.3	6.1	7.0	7.9	8.8	9.7	10.5	11.4
14	4.3	5.2	6.1	6.9	7.8	8.7	9.6	10.4	11.3
15	4.3	5.2	6.0	6.9	7.7	8.6	9.5	10.3	11.2
16	4.3	5.1	6.0	6.8	7.7	8.5	9.4	10.2	11.1
17	4.2	5.1	5.9	6.7	7.6	8.4	9.3	10.1	11.0
18	4.2	5.0	5.8	6.7	7.5	8.3	9.2	10.0	10.8
19	4.1	5.0	5.8	6.6	7.4	8.3	9.1	9.9	10.7
20	4.1	4.9	5.7	6.5	7.4	8.2	9.0	9.8	10.6

For appliances older than 20 years, you must use the formula:

$$\text{Derated efficiency} = \text{original efficiency} \times (0.99)^{\text{age}}$$

(See: DOE WPN 19-4 for more details)

APPENDIX E

MEASURE SKIPPING

(From DOE WPN 19-4, Attachment 8)

ATTACHMENT 8 MEASURE SKIPPING CLARIFICATION

“Measure skipping” is defined as follows: Not installing, in order of decreasing Savings to Investment Ratio (SIR), the cost-justified Energy Conservation Measures (ECMs) and related Incidental Repairs Measures (IRM) included in the work scope produced by the Department of Energy (DOE) approved energy audit tool or priority list.

“Major Measure” is defined as follows: A high priority measure, which if skipped, would result in “partial” weatherization of a unit. Major measures are as follows: air sealing, duct sealing of ducts outside the thermal boundary, attic insulation, wall insulation and floor or belly insulation.

Measure skipping of cost-justified major measures is not permitted at any time.

Alteration of the cost-justified work order must be addressed in the following ways:

Funding limitations: If all funds available to be spent on the job will not cover the entire work scope, then measures may be removed from the work order starting with the lowest SIR measure and working up the list from there. The work order must remain overall cost-effective or the job must be deferred. Necessary Health and Safety (H&S) measures may NOT be removed from the work order; however, ECMs can be removed.

Prior to work beginning: Client education is important to inform a client of planned measures and material use. Resistance from a client to install any measures and/or materials planned as a result of an energy audit directed work order or priority list should be addressed with either additional education and/or re-running the energy audit with a different - but acceptable - material to determine if the substitute material is cost effective. If no cost-effective option for the material can be identified, the auditor should again explain and discuss the situation with the building owner or occupant. If the building owner or occupant still declines a measure, not defined as a major measure, **the auditor must include in the client file a comprehensive justification, including background/source documents that support the decision to skip a specific measure.** All other weatherization measures must be installed. **If the auditor cannot access background/source documents that justifies the building owner/occupant’s decision to decline a measure or the measure is defined as a “major measure,”** the situation must be fully documented in the client file and the job must be deferred due to client refusal.

Inadequate training: A lack of training for Subgrantees is not an allowable reason to skip measures. Standard procedure should be to postpone job(s) requiring priority measures that cannot be installed due to lack of trained staff until adequate training is acquired. After a job has begun: Due to scheduling, measures are sometimes installed with a lower priority first. If during the installation process, the client declines a higher priority measure, work must stop at the time the client declined the higher priority measure. No further installation is allowed and the job must be inspected by a Quality Control Inspector (QCI) and closed out as a completed unit. This should be clearly explained in client file documentation. Some agencies include a statement for client signature that states the client is aware and accepts all WAP rules, including the specific services and measures determined by an energy audit.

A General Heat Waste (GHW) measure, as previously approved in the Grantee’s energy audit, may be skipped for any documented reason (including declined by client). GHW measures are not prioritized by the energy audit tool. The measures may be at the top of an approved priority list; however, there is no strict prohibition from skipping an individual GHW measure. If a Grantee chooses to include ECMs in the SIR calculations that could have been approved as GHW, then the prioritized measure must be treated as other prioritized measures and skipping is not allowed.

APPENDIX F

ASHRAE 62.2 (Using RedCalc)

RED ASHRAE 62.2-2016 Ventilation [Reset] [Print]

New or existing construction: Existing
 Dwelling unit is: Detached
 Use infiltration credit: Yes

Closest weather station: United States
 Oklahoma
 McAlester Municipal AP

Weather and shielding factor [1/m] = 0.15

Floor area [sq ft] 1320
 Number of occupants 3
 Dwelling height [ft] 8
 Measured leakage @ 50Pa [CFM] 1000

☐ Use Advanced Blower Door Inputs

☒ Use Local Ventilation Alternative Compliance

Kitchen Included ☒ # Baths Included 2

	Fan Flow [CFM]	Openable Window	Deficit [CFM]
Kitchen	0	<input checked="" type="checkbox"/>	80
Bath #1	50	<input checked="" type="checkbox"/>	0
Bath #2	17	<input checked="" type="checkbox"/>	13

Total deficit [CFM] = 93

Dwelling-Unit Ventilation Results

Effective annual avg infiltration rate [CFM] = 23
 Total required ventilation rate, Q_{tot} [CFM] = 62.1
 Alternative compliance supplement [CFM] = 23.25
 Infiltration credit, Q_{inf} [CFM] = 23
 Required mechanical ventilation rate, Q_{fan} [CFM] = 62

Dwelling-Unit Ventilation Run-Time Solver

Fan capacity [CFM] =
 Fan run-time per hour [min] =

Dwelling-Unit Leakage Rate Solver

Target mechanical ventilation rate [CFM] 15
 Corresponding measured leakage @ 50Pa [CFM] = 3020

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When you are done, print on paper or print as a PDF

Choose the best match weather station. Could be in another state.

Input # bedrooms plus 1 (or # of occupants, whichever is greater)

Input your Target blower door (post WX), not the pre- blower door. Run this calculation again when you have the final Actual blower door result.

You can input 50 here for a NEW ASHRAE fan that will be installed if:

(a) The fan can increase, when needed, to pull 50 CFM or more.
 OR
 (b) The fan has a flow rate of at least 20 CFM continuous

Check the box if the room has an operable window

Required Continuous fan flow rate

If you want to use a timer, input here the ACTUAL flow rate of the installed fan to discover its required run time per hour

Because the target rate is set at 15 CFM (the point at which no fan is needed), this tells us the minimum blower door at which no fan will be needed.

NOTE: A half bath is not counted as a bathroom for the purposes of 62.2. Even if there is a fan in it, neither the room nor the fan should be entered in the 62.2 calculation.

APPENDIX G

Fuel Costs and Fuel Switching

- The following table shows average fuel prices for Oklahoma with the most recent data available (from eia.gov). Your Setup Library must reflect these prices.
 - If your regional prices are significantly different, you can apply to ODOC for an exemption to change your fuel costs.

Fuel Type	State Average Cost
Electricity	\$0.082 per KWh
Natural Gas	\$9.25 per MCF
Propane	\$1.79 Per Gallon
Wood	\$260 Per Cord
Fuel Oil	\$2.90 per Gallon
Other	\$20 Per MMBTU ¹⁶

- Use **OTHER** fuel type for **Wood Pellets only**.
- The accuracy of fuel pricing in NEAT is critical to an accurate energy model. NEAT calculates the heat loss for the home, but it requires the fuel costs to convert that heat loss into dollars. Only then can an accurate SIR be calculated for shell and HVAC measures.

ODOC Fuel Switching Policy

Fuel Switching is not an allowable policy in Oklahoma in Program Year 2020.

¹⁶ Assuming \$250 per ton of hardwood pellets and a stove efficiency of 75%.

Appendix H

Additional Resources and Attachments

Attached Documents and Forms

1. Form 25 – Client H&S Education Checklist
2. Form 28A – For Site Built Data Collection
3. Form 28B – For Mobile Home Data Collection
4. Form 32 – Mold Disclosure
5. Form 33 – Deferral Form
6. Form 35 – Client Satisfaction Form
7. Form 36 – Radon Consent Form
8. Form 44 – QCI Report
9. Form 45 – Energy Audit Checklist
10. ODOC WAP Target Spreadsheet
11. NEAT/MHEA Library Measures Checklist

Additional Resources

1. [DOE Active WPN and MEMO - https://www.energy.gov/eere/wipo/weatherization-program-notice](https://www.energy.gov/eere/wipo/weatherization-program-notice)
 - a. For all active WPN and Memo information from DOE.
2. [ODOC WAP Guidance - https://www.okcommerce.gov/community-development/community-action-agencies/weatherization-assistance-program-wap/](https://www.okcommerce.gov/community-development/community-action-agencies/weatherization-assistance-program-wap/)
 - a. For ODOC WAP guidance.